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INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

We make Indiana a cleaner, healthier place to live

Evan Bayh
Governor
Kathy Prosser
Commissioner

100 North Senate Avenue
P.O. Box 6015
Indianapolis, Indiana 46206-6015
Telephone 317-232-8603
Environmental Helpline 1-800-451-6027

December 14, 1995

Mr. Kent Fase
Remediation Manager
Amoco Oil Company
Mail Code 242
2815 Indianapolis Boulevard
Whiting, IN 46394

Re: Effective Date of Agreed Order
Cause No. H-11187

Dear Mr. Fase:

This is in response to your inquiry regarding the effective date of the above-referenced Resource Conservation and Recovery Act Corrective Action Agreed Order. The effective date of the Agreed Order is the date stamped on the certified mail domestic return receipt: December 8, 1995. Time frames for compliance are operative from that date.

Per your request, we have enclosed a copy of the Order with Exhibits on diskette, formatted for WordPerfect 5.1/5.2.

If you have questions or require additional information, please contact me at (317) 232-3406.

Sincerely,

Michael E. Sickels, Chief
Corrective Action Section
Hazardous Waste Facilities Branch
Solid and Hazardous Waste Management

Enclosures

cc: Ms. Lorna Jereza, U.S. EPA, Region 5 (without diskette)

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IN THE MATTER OF:	)	
	)	
COMMISSIONER,	)	
	)	
INDIANA DEPARTMENT OF	)	
ENVIRONMENTAL MANAGEMENT	)	
	)	
Complainant	)	
	)	
vs.	)	
	)	Cause No. H-11187
AMOCO OIL COMPANY	)	
WHITING REFINERY	)	
WHITING, INDIANA	)	
IND 074 375 585	)	
	)	
Respondent	)	

CORRECTIVE ACTION AGREED ORDER

A. JURISDICTION

This Administrative Agreed Order is issued pursuant to the authority vested in the Commissioner of the Indiana Department of Environmental Management (Commissioner) by Indiana Code (IC) 13-7, the Environmental Management Act.

This Agreed Order is entered into between the Indiana Department of Environmental Management (hereinafter referred to as "Department", or "IDEM") and Amoco Oil Company (hereinafter referred to as "Amoco"), Respondent, the owner and operator of the Amoco Whiting Refinery. Respondent consents to and agrees not to contest the Indiana Department of Environmental Management's jurisdiction to issue and enforce this Agreed Order. Respondent

agrees to undertake the actions required by the terms and conditions of this Agreed Order. However, Respondent reserves all rights it may have under common law, the Indiana Code, and federal statutes to seek contribution or indemnity from others not signatories to this Agreed Order.

In agreeing to the issuance of this Order, and entering into this Order, the Respondent does not admit any liability alleged herein nor any findings of fact or conclusions of law and determinations contained in this document.

B. PARTIES BOUND

1. This Agreed Order shall apply to and be binding upon Respondent and its officers, directors, employees, agents, successors and assigns, and upon all persons, independent contractors, contractors, and consultants acting under or for Respondent in implementing its terms.

2. No change in ownership or corporate or partnership status relating to the Facility will in any way alter Respondent's responsibility under this Agreed Order except that Respondent may assign this Agreed Order to a subsequent owner of the Facility.

3. Respondent shall provide a copy of this Agreed Order to all contractors, subcontractors, laboratories, and consultants retained to conduct or monitor any portion of the work performed pursuant to this Agreed Order prior to, or on, the date of such retention, and shall condition all such contracts on compliance with the terms of this Agreed Order.

4. Respondent shall give notice of this Agreed Order to any successor in interest prior to transfer of ownership or operation of the Facility and shall notify the Indiana Department of Environmental Management within sixty (60) days prior to such transfer. Such notice shall be addressed to the Project Coordinator as set out in paragraphs F.10. and F.11. below.

C. STATEMENT OF PURPOSE

In entering into this Agreed Order, the mutual objectives of the Indiana Department of Environmental Management (hereinafter referred to as the "Department") and Amoco are: (1) to perform Interim Measures (IM) as necessary to mitigate any threat to human health and the environment; (2) to perform a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) to further define the nature and extent of any release of hazardous waste or

a constituent of a hazardous waste from Solid Waste Management Units (SWMUs) at the Facility; and (3) to perform a Corrective Measures Study (CMS) to identify and evaluate alternatives for the corrective action necessary to prevent or mitigate any migration of releases of hazardous waste or a constituent of a hazardous waste from SWMUs at or from the Facility. Further, the Department and Amoco agree to investigate the nature and extent of the potential impacts (if any) on the public health or welfare, or the environment caused by releases of petroleum from the Facility, the Dock Area, and the J&L Site with a workplan as defined in Exhibit D, and a workplan for non-petroleum contamination at the J&L site as defined in Exhibit H.

D. FINDINGS OF FACT

1. Amoco is a company doing business in the State of Indiana and is a person as defined in Indiana Administrative Code (IAC) 329 IAC 3.1-4-20, Hazardous Waste Management Permit Program and Related Hazardous Waste Management Requirements.

2. At all times relevant to this proceeding, up to and including the present, Respondent has owned property located at 2815 Indianapolis Boulevard, Whiting, Indiana. The total property covers 1700 acres located in portions of Sections 8, 17 and 20, Township 37 North, Range 9 West, Lake County. The geographic coordinates of the Facility are 41 degrees, 37 minutes, 0 seconds N latitude and 87 degrees, 29 minutes, 0 seconds W longitude.

   Amoco property (herein referred to as the Facility) to be addressed by this Order consists of areas commonly known as:

   a. the Refinery Area (consisting of the "Main Refinery," the "Indiana Tank Field," the "Stieglitz Tank Field," the "South Tank Field," and the "South Tank Field Annex"), which is bordered on the north by Standard Avenue, on the south by Riley Road and the former Energy Cooperative, Inc. (ECI) property, on the southwest by the J&L Site, on the west and northwest by residential area, and to the east and southeast by LTV Steel; and

   b. the Buffalo Side, which is bordered on the south by Standard Avenue and on the north, east and west by Amoco Chemicals Company property;

   In addition to the above, Amoco property to be addressed by Exhibit D to this Agreed Order are areas commonly known as:

a. the Dock Area, which is located southeast of the South Tank Field Annex, is bordered on the south by the Lake George branch of the Indiana Harbor Ship Canal, and on the east by US Gypsum, and on the west by Safety-Kleen; and

b. The J&L Tank Field and the Lake George Tank Field.

Amoco property to be addressed by Exhibit H to this Agreed Order includes the area commonly known as:

a. The J&L Site, which is bordered on the north by 129th street, on the west by Calumet Avenue, on the east by B&O Railroad property, and extends south of the Lake George Canal, including the J&L Tank Field, Lake George Tank Field, except parcels owned by Energy Cooperative, Inc. (ECI); as shown in Attachment A to Exhibit H.

This Order excludes the area known as the Lakefront Wastewater Treatment Facility, for which Corrective Action is on-going under the Respondent's Federal RCRA Permit, and the xylene release site north of the Calumet Avenue Warehouse which will be addressed under a separate order between Amoco and IDEM.

3. Since 1889, Respondent has operated a petroleum refinery at the Facility. Respondent has generated hazardous waste at this Facility, and Respondent has engaged in storage of hazardous waste at the Facility subject to interim status requirements of 329 IAC 3.1. Respondent also operated tank storage units (SO2) at the Facility.

4. Respondent owned and operated certain facilities within its Facility as hazardous waste management facilities on and after November 19, 1980, the applicable date which renders facilities subject to said interim status requirements.

5. Pursuant to Section 3010 of the Resource Conservation and Recovery Act (RCRA), 42 United States Code (U.S.C.), 6930, Respondent notified the United States Environmental Protection Agency (EPA) of its hazardous waste activity, and was assigned the EPA I.D. No. IND 074 375 585. In its notification dated August 14, 1980, Respondent identified itself as a generator and transporter of hazardous waste and as an owner/operator of a treatment and storage facility for hazardous waste.

6. In its Part A permit application dated on or about November 18, 1980, the Respondent identified itself as operating tank storage units (SO2), drum storage units (SO1), and a miscellaneous treatment unit (TO4) identified as a sour water stripper. The Respondent identified these units as handling the following hazardous wastes at the Facility:

   a. Characteristic hazardous wastes identified at 329 IAC 3.1-6-1(8)/40 Code of Federal Regulations (CFR) 261.21-24:
      (1) D002 (corrosive wastes), and
      (2) D003 (reactive wastes);

   b. Hazardous wastes from non-specific sources identified at 329 IAC 3.1-6-1(9)/40 CFR 261.31:
      (1) F001 (spent halogenated solvents used in degreasing),
      (2) F002 (spent halogenated solvents),
      (3) F003 (spent non-halogenated solvents), and
      (4) F005 (spent non-halogenated solvents); and

   c. Discarded commercial chemical products, off-specification species, container residues and spill residues thereof, which are hazardous wastes when discarded, identified at 329 IAC 3.1-6-1(11)/40 CFR 261.33:
      (1) U002 (acetone),
      (2) U019 (benzene),
      (3) U024 (dichloromethoxy ethane),
      (4) U045 (chloromethane),
      (5) U056 (cyclohexane),
      (6) U123 (formic acid),
      (7) U154 (methanol),
      (8) U159 (methyl ethyl ketone),
      (9) U165 (naphthalene),
      (10) U188 (phenol),
      (11) U208 (1,1,1,2-tetrachloroethane),
      (12) U209 (1,1,2,2-tetrachloroethane),
      (13) U220 (toluene),
      (14) U221 (toluenediamine),
      (15) U226 (1,1,1-trichloroethane),
      (16) U227 (1,1,2-trichloroethane),
      (17) U228 (trichloroethene), and
      (18) U239 (xylene).

7. In a revised Part A application dated March 16, 1982, the drum storage unit (SO1) was deleted by Respondent because the unit did not operate subsequent to May 19, 1980. However, no hazardous waste codes were deleted by Respondent.

8. In November, 1982, the Respondent submitted a Part B application for tank storage (SO2) of spent caustic (D002, D007, D008) and 1,1,1-trichloroethane (F002) and the sour water stripper treatment unit (TO4). The SO2 storage for F002 hazardous waste was not included in the final permit because the 1,1,1-trichloroethane tanks had gone through final closure by time of Part B issuance. The TO4 unit was also excluded because it was determined to be part of a totally enclosed treatment system and, therefore, not subject to the requirements of 40 CFR 264.1(g)(5). The final permit, effective from July 16, 1987, through July 16, 1992, was issued for storage of spent caustic hazardous waste in five (5) tanks with a combined design capacity of 258,200 gallons.

9. During the effective period of the final Part B permit, all five (5) tanks were partially closed. All were either taken out of service or incorporated into Respondent's process for pH control at the Lakefront Wastewater Treatment Facility.

10. In a subsequent notification of hazardous waste activity dated March 27, 1990, Respondent identified itself as: a generator and transporter of hazardous waste; an owner and operator of a storage facility for hazardous waste; and a burner of off-specification used oil fuel in utility boilers, industrial boilers, and industrial furnaces. In the March 27, 1990, notification, Respondent also identified the hazardous wastes currently handled at the Facility as follows:

    a. Characteristic hazardous wastes identified at 329 IAC 3.1-6-1(8)/40 CFR 261.21-24:
        (1) D001 (ignitable wastes),
        (2) D002 (corrosive wastes), and
        (3) D000 (toxic wastes);

    b. Hazardous wastes from non-specific sources identified at 329 IAC 3.1-6-1(9)/40 CFR 261.31:

        (1) F001 (spent halogenated solvents used in degreasing),
        (2) F002 (spent halogenated solvents),
        (3) F003 (spent non-halogenated solvents), and
        (4) F005 (spent non-halogenated solvents);

c. Hazardous wastes from specific sources identified at 329 IAC 3.1-6-1(10)/40 CFR 261.32:
   (1) K050 (heat exchanger bundle cleaning sludge from the petroleum refining industry) and
   (2) K052 (tank bottoms, leaded, from the petroleum refining industry); and

d. Discarded commercial chemical products, off-specification species, container residues and spill residues thereof, which are hazardous wastes when discarded, identified at 329 IAC 3.1-6-1(11)/40 CFR 261.33:
   (1) P110 (Tetraethyl lead),
   (2) U002 (acetone),
   (3) U019 (benzene),
   (4) U045 (chloromethane),
   (5) U069 (dibutyl phthalate),
   (6) U151 (mercury),
   (7) U154 (methanol),
   (8) U159 (methyl ethyl ketone),
   (9) U165 (naphthalene)
   (10) U188 (phenol),
   (11) U220 (toluene),
   (12) U226 (1,1,1-trichloroethane),
   (13) U227 (1,1,2-trichloroethane),
   (14) U228 (trichloroethene), and
   (15) U239 (xylene).

11. Solid waste management units (SWMU's) have been identified at the Facility and are indicated in Exhibit F attached hereto and incorporated herein by reference.

12. The existing property grade is primarily level with the ground surface generally sloping gently toward Lake Michigan to the northeast. The regional surficial geology consists of thin gravel and silty sand overlain by manmade fill composed of reworked natural sand mixed with gravel, rubble, and steel mill slag. The dominant regional ground water movement is toward Lake Michigan to the north and Lake George to the west, with movement also occurring toward the Lake George Canal and Indiana Harbor Canal. At the Main Refinery, South Tank Field, and South Tank Field Annex areas of the Facility, the local groundwater flow is influenced by wellpoint systems installed by Respondent and tends to flow toward the Facility boundaries. (Burns & McDonnell, Refinery Area Investigation Report, June 1991.)

13. Respondent's Facility is located in a mixed industrial/residential area. A residential area borders the Facility's northwestern portion. Exhibit G attached hereto and incorporated herein by reference, indicates the location of the Respondent's Facility, neighboring industrial sites, and the residential area. Lake Michigan, approximately 1000 feet north of the Facility, and Whihala Park in the City of Whiting, just northwest of the Facility, are used for recreational purposes.

14. Groundwater occurs in the unconsolidated anthropogenic fill layers and natural sand that comprise the Calumet Aquifer. Groundwater occurs at a depth of 0.5 to 9 feet across the Facility. The Calumet Aquifer is not used as a main source of drinking water in the area. However, a drinking water well is located in Whihala Park, and several nearby residents have private wells producing water for gardening, landscaping, and maintenance. The Calumet Aquifer discharges into Lake Michigan in areas where groundwater is not artificially rerouted or recovered. Surface water runoff and groundwater discharges from industries and cities along the Indiana Harbor and Lake George Canals also enter Lake Michigan. The intake to the Whiting Refinery water supply is situated in Lake Michigan approximately a quarter of a mile north/northeast from the Facility. Lake Michigan is the major source of drinking water for the area. The city of Whiting is served by the same intake as the Whiting Refinery. The Facility has an NPDES permitted discharge at its Lakefront Wastewater Treatment Facility (LWWTF).

15. Respondents' submittal "Refinery Area Investigation Report" (Burns & McDonnell, 1991) may be included as a portion of the RCRA Facility Investigation, Task I: Description of Current Conditions, as Ordered below in Section F. 2 of this Agreed Order. Said submittal must pass all Quality Control/ Quality Assurance measures required for acceptance by this Agreed Order in all material respects.

16. Amoco has provided IDEM, the Indiana State Board of Health, and other applicable local, state and federal agencies and officials with information including, but not limited to: refinery-wide groundwater investigation workplans and results; off-site area investigation workplans and results; J & L site workplans and characterizations; residential well sampling program, data summary, and screening level risk assessment; groundwater monitoring information and results from the lakefront wastewater treatment plant; information regarding groundwater flows, surface water flows, and levels; and regular updates of remedial measures now underway at and in the vicinity of the refinery.

17. Amoco submitted to IDEM in November, 1989, a refinery-wide groundwater investigation workplan entitled, "Refinery Area Workplan, Groundwater Investigation, Whiting, Indiana Refinery, Amoco Oil Company." This plan was approved by IDEM on July 12, 1990.

18. Amoco has undertaken numerous interim remedial measures to address petroleum releases and waste management sites. Recent and ongoing interim remedial measures are detailed in Exhibit I.

19. Amoco has conducted a public involvement and communication program concerning its remedial activities in connection with the Whiting Refinery since 1991, with the participation, as a member of the committee, of the Indiana Department of Environmental Management.

E. CONCLUSIONS OF LAW AND DETERMINATIONS

Based on the Findings of Fact set out above, and after consideration of the administrative record, the Department has made the following conclusions of law and determinations.

1. Respondent is a "person" as defined in paragraph D.1. above.

2. Respondent is or was the owner and/or operator of a facility subject to IC 13-7 and 329 IAC 3.1 (formerly 329 IAC 3 and 320 IAC 4).

3. Certain wastes and constituents thereof found at the Facility are hazardous wastes or constituents of a hazardous waste as defined by IC 13-7-1-7, IC 13-7-1-12 and 329 IAC 3.1-6 (Section 1004(5) of RCRA, 42 U.S.C. Section 6903(5)). These are also hazardous wastes or constituents of a hazardous waste within the meaning of Section 3001 of RCRA, 42 U.S.C. Section 6921 and 40 CFR Part 261.

4. Pursuant to IC 13-7-8.5-5.5,

   a. The Commissioner may:

      1) issue an order requiring corrective action or another response measure that the Commissioner considers necessary to protect human health or the environment; or

2) commence a civil action to compel corrective action as described in subdivision (1).

b. Under subsection (a), the Commissioner or a court may order the performance of corrective action beyond the boundaries of the facility from which the release occurs. However, corrective action may not be ordered by the Commissioner beyond the boundaries of the facility if the owner or operator of the facility demonstrates to the satisfaction of the Commissioner that, despite the best efforts of the owner or operator, the owner or operator is unable to obtain the necessary permission to undertake that corrective action.

c. An order issued by the Commissioner under this section:

1) must state with reasonable specificity the nature of corrective action or other response measure required by the order; and

2) must specify deadlines for compliance.

5. Based on information gathered by the Department, there is or has been a release of a constituent of a hazardous waste into the environment from Respondent's Facility.

6. The actions required by this Agreed Order are authorized or required pursuant to IC 4-21.5.

F. ORDER

Pursuant to IC 13-7, Respondent agrees to perform the following acts in the manner and by the dates specified herein. All RCRA IM, RFI and CMS work undertaken pursuant to this Agreed Order at the Facility shall be performed in a manner consistent with, at a minimum: Exhibit A, Interim Measures Workplan (IM Workplan); Exhibit B, Scope of Work for a RCRA Facility Investigation (RFI); and Exhibit C, Scope of Work for a Corrective Measures Study (CMS); all attached hereto and incorporated herein by reference. Relevant guidance may include, but is not limited to: the "RCRA Ground-water Monitoring: Draft Technical Guidance" (EPA/530-R-93-001, November, 1992); and "Test Methods for Evaluating Solid Waste" (SW-846, as amended; November, 1986). All work undertaken pursuant to Exhibit D, agreement pursuant to Indiana petroleum release law, IC 13-7-20.1 for a facility investigation for a petroleum release, and Exhibit H, Agreement for a Facility

Investigation at the J & L Site, shall be performed in a manner consistent with Exhibit A, Interim Measures Workplan (IM Workplan); Exhibit B, Scope of Work for a RCRA Facility Investigation (RFI); and Exhibit C, Scope of Work for a Corrective Measures Study (CMS) to the extent that the elements of said exhibits are relevant and appropriate.

1. PREVENTATIVE MEASURES

a. Within one-hundred-eighty (180) days of the effective date of the Agreed Order, Respondent shall submit to the Department a plan to implement those preventative measures identified in Exhibit F attached to this Agreed Order and incorporated herein. The plan shall identify the structural designs and methods of implementation of measures identified as being necessary to prevent future releases to the environment. The Department will review this plan and will either approve the plan or provide written notice of alleged deficiencies. If the Department returns to the Respondent a written notice of alleged deficiencies in the plan, the Respondent shall, within sixty (60) days after receiving notice of such deficiencies, either modify the workplan in accordance with the notice, or within fifteen (15) days of such notice of deficiencies, request a meeting to discuss said deficiencies. The Respondent shall, within forty-five (45) days after meeting with the Department to discuss such deficiencies, submit a revised plan to the Department which addresses the alleged deficiencies.

b. Within ninety (90) days of approval of the preventative measures plan, the Respondent shall implement the plan. According to the timetable developed in the plan, the Respondent shall submit to the Department a final report on the implementation of the required preventative measures. The final report will detail the work completed and the plans and schedules for any required routine inspections and actions. The Department will review this final report and will either approve it or provide written notice of alleged deficiencies. If the Department returns to the Respondent a written notice of alleged deficiencies in the final report, the Respondent shall, within sixty (60) days after receiving notice of such deficiencies, either modify the report in accordance with the notice, or within fifteen (15) days of such notice of deficiencies, request a meeting to discuss said deficiencies. The Respondent shall, within forty-five (45) days after meeting with the Department to discuss such deficiencies, submit a revised report to the Department which addresses the alleged deficiencies. Upon approval of the final report, the

Respondent will have completed the Preventative Measures requirements of this Agreed Order and is bound to continue those routine measures identified in the final report. During implementation of these preventative measures, Respondent may propose modifications to the plan based on new data, changed conditions, and/or other good cause.

2. INTERIM MEASURES

a. In the event the Respondent identifies a current or imminent threat to human health or the environment, the Respondent shall immediately notify the Department orally, and in writing within seven (7) days, summarizing the immediacy and magnitude of the threat to human health or the environment. Within fifteen (15) days of notifying the Department, the Respondent shall submit to the Department an IM Workplan for approval that identifies Interim Measures which mitigate this threat and are consistent with and integrated into any long term solution at the Facility.

b. The IM Workplan shall ensure that the Interim Measures are designed to mitigate current or imminent threat(s) to human health or the environment and are consistent with and integrated into any long term solution at the Facility. The IM Workplan shall document procedures to be used by the Respondent for the implementation of Interim Measures.

c. The IM workplan shall be developed in accordance with Exhibit A, herein.

d. In the event the Respondent identifies that any drinking water supply well has been contaminated by the Respondent's activities in a manner that threatens the public health, the following Interim Measure shall be initiated:

(1) Within five (5) days, the Respondent shall provide Respondent maintained treatment or an alternate water supply to the affected parties;

(2) Within seven (7) days of contaminant identification, the Respondent shall submit a report to the Department detailing the activity pursued and a plan for further Interim Measure activity;

(3) Within fourteen (14) days following the Department's

transmission of comments, the Respondent shall revise the plan in accordance with the Department's comments; and

(4) Within thirty (30) days following the Department's approval or modification of the plan, the Respondent shall implement the revised plan in accordance with the schedule therein.

3. RCRA FACILITY INVESTIGATION (RFI)

a. Within one-hundred-eighty (180) days of the effective date of the Agreed Order, Respondent shall submit to the Department an RFI Workplan for a RCRA Facility Investigation ("RFI Workplan"). The RFI Workplan is subject to approval or modification and approval by the Department as described in Paragraph e. below and shall be performed in a manner consistent with the RFI Scope of Work contained in Exhibit B herein and shall incorporate by reference those workplans, data, analyses, results, and information developed by the Respondent to date and in accordance to Section F.5 of this Order.

b. The RFI Workplan shall be SWMU and AOC specific and be designed to investigate releases to the environment and/or correct potential release pathways as outlined in the list provided as Exhibit F of this Agreed Order.

c. The RFI Workplan shall be designed to define the presence, magnitude, extent, direction, and rate of movement of any hazardous wastes or constituents of a hazardous waste within and beyond the Facility boundary, to the extent that this work has not already been done, to meet the objectives of the RFI. The RFI Workplan shall document the procedures the Respondent shall use to conduct those investigations necessary to: (1) characterize the potential pathways of contaminant migration; (2) characterize the source(s) of contamination; (3) define the degree and extent of contamination; (4) identify actual or potential receptors; and (5) support the development of corrective measure alternatives including use of Corrective Action Management Units (CAMU) or land use restrictions where appropriate. A specific schedule for implementation of all activities not already conducted in accordance with Section F.5 of this Order by the Respondent under existing workplans shall be included in the RFI Workplan.

d. The RFI Workplan shall be developed in accordance with Exhibit B,

herein.

e. If the Department returns to the Respondent a written notice of alleged deficiencies in the RFI Workplan, the Respondent shall, within sixty (60) days after receiving notice of such deficiencies, either modify the workplan in accordance with the notice, or within fifteen (15) days of such notice of deficiencies request a meeting to discuss said deficiencies. The Respondent shall, within forty-five (45) days after meeting with the Department to discuss such deficiencies, submit a revised workplan to the Department which addresses the alleged deficiencies.

f. Within thirty (30) days of discovery of any new SWMU (located at one location for over one-hundred-twenty (120) days) that has potential of releasing hazardous constituents at the Facility, Respondent shall notify the Department's Project Manager of its existence. Based on the information given, the project manager will determine whether any written information will be required, such as:

1. The location of the unit on the site topographic map;

2. Designation of the type of unit;

3. General dimensions and structural description;

4. When the unit was operated; and

5. To the extent possible, specifications of waste(s) managed at the unit.

6. Any release of hazardous waste(s) or constituents of hazardous waste from the unit.

The Department will review the information provided under this condition and may as necessary require further investigation. Upon notice that further investigation is required, Respondent shall submit a written addendum to either (1) the RCRA Facility Investigation Workplan, or (2) to the remedial investigation workplan under Exhibit D, depending on which of the workplans the investigation of the new SWMU fits best. This addendum will be due to the Department ninety (90) days after written notification by the Department that further investigation of a newly identified SWMU is necessary, or incorporated

into the appropriate workplan, whichever occurs later.

4. CORRECTIVE MEASURES STUDY (CMS)

a. After completion of the RCRA Facility Investigation and within ninety (90) days of written notice of approval of the RFI report, the Respondent shall submit a Corrective Measure Study Plan in accordance with the CMS Scope of Work in Exhibit C herein, after receipt of the Department's directive to continue corrective action.

b. Within sixty (60) days of notice of approval, or approval with modification, Respondent shall begin a Corrective Measures Study in accordance with the approved plan.

c. If the Department returns to the Respondent a written notice of alleged deficiencies in the Corrective Measures Study Workplan, the Respondent shall, within sixty (60) days after receiving notice of such deficiencies, either modify the workplan in accordance with the notice, or within fifteen (15) days of such notice of deficiencies request a meeting to discuss said deficiencies. The Respondent shall, within forty-five (45) days after meeting with the Department to discuss such deficiencies, submit a revised workplan to the Department which addresses the alleged deficiencies.

5. SUBMISSIONS, AGENCY APPROVAL, AND ADDITIONAL WORK

a. After three (3) submissions of any workplan(s), program plan(s) or report(s) by the Respondent, the Department may modify and approve any such plan(s) or report(s). Such modification and approval is subject to the dispute resolution paragraph 13.

b. As noted in Paragraphs 2.a. and 3.b. above within sixty (60) days of notice of approval, or modification and approval, by the Department of any workplan(s), Respondent shall commence work and implement the tasks required by the workplan(s) submitted pursuant to the Scopes of Work contained in Exhibits A, B, and C herein, in accordance with the standards, specifications and schedule stated in the workplan(s) as approved or modified and approved by the Department.

c. Beginning with the third full month following the effective date of the Order, Respondent shall provide the Department with a quarterly progress report on the tenth day following each three month period. The progress report shall conform to requirements in the relevant Exhibit(s) herein. In order to ensure that work proceeds on a timely basis, and to minimize the number and length of Respondent submissions and subsequent review time, all progress reports required by the relevant Exhibits are to be combined into one quarterly progress report for the entire Facility.

d. All time frames that are specified in this Order have precedence over time frames specified in Exhibits A, B, and C.

e. Respondent shall provide draft and final Interim Measures, RCRA Facility Investigation, Corrective Measure Study, and progress reports to the Department in accordance with the schedule contained in this Order and its Exhibits herein.

f. The Department will review all draft or final reports and notify Respondent in writing of the Department's approval, disapproval or modification and approval of the report or any part thereof. In the event of any disapproval, the Department shall specify in writing the deficiencies and reasons for such disapproval. Within sixty (60) days of the receipt of the Department's disapproval of any report, Respondent shall amend and submit a revised report, unless Respondent, within fifteen (15) days of receipt of such notice requests a meeting to discuss such deficiencies or disapproval. The Respondent shall, within forty-five (45) days after meeting with the Department to discuss such deficiencies, submit a revised report to the Department which addresses the requested modifications or deficiencies. All Department approved reports shall be deemed incorporated into and part of this Order by reference.

g. Six (6) copies of all documents, including workplans, Program Plans, preliminary and final reports, progress reports, and other correspondence to be submitted pursuant to this Order shall be hand delivered (including delivery by overnight services) or sent by certified mail, return receipt requested, to the Project Coordinator designated pursuant to Sections F.10. and F.11. of this Order below.

h. Any written response shall be deemed timely performed if hand delivered or postmarked by the last day of any time period prescribed

herein. Whenever a party has the right or is required to do some act or make some response within a prescribed time period after the service of a notice or other paper and the notice or paper is served by mail, three (3) days shall be added to the prescribed period.

i. Whenever any party is called upon to respond or otherwise act in a certain number of days, and if the final day occurs on a Saturday, Sunday, or legal holiday (whether state or national), such time limitation shall automatically extend to the next business day after such Saturday, Sunday, or holiday.

j. All work performed pursuant to this Order shall be under the direction and supervision of a professional engineer or geologist with expertise in hazardous waste site investigation. On or before the effective date of this Order, Respondent shall notify the Department in writing of the name, title, and qualifications of the engineer or geologist. Names, titles, and qualifications of contractors or subcontractors and their personnel to be used in carrying out the terms of this Order will be identified to the Department as they are employed for tasks required by this Order. The Department shall be notified in a timely fashion so as not to interrupt the required work or submissions of the Respondent, of the departure and replacement of the engineer or geologist in charge of work required by this Order. The Department shall similarly notify the Respondent of personnel changes in the Department that may affect approval or modifications of work underway or approved.

k. The Department may determine that certain tasks, including investigatory work or engineering evaluation, are necessary in addition to the tasks and deliverables included in this Order when new findings indicate that such additional work is necessary. The Department shall request in writing that Respondent perform the additional work in this situation and shall specify the basis and reasons for the Department's determination that the additional work is necessary. Within twenty (20) days after the receipt of such request, Respondent shall have the opportunity to meet with the Department to discuss the additional work the Department has requested. Unless the Department can show that the work is necessary to protect human health or the environment, Respondent is not bound to perform additional work outside the scope of work the Department has requested according to a Department approved workplan. All additional work performed by Respondent under this paragraph shall be performed in a manner consistent with this Order.

Respondent may submit reports regarding any work completed prior to the effective date of this Order. IDEM will review these reports and if appropriate, approve the use of these reports and data in Work Plans required to be submitted under this Order. IDEM will not approve or accept any report which has not been certified as to its authenticity by Respondent and is not supported by the appropriate chain of custody documentation.

6. QUALITY ASSURANCE

Throughout all future sample collection and analysis activities conducted pursuant to this Agreed Order, Respondent shall use Department approved quality assurance, quality control, and chain-of-custody procedures. In addition, Respondent shall:

a. Ensure that laboratories used by Respondent for analyses, perform such analyses according to the EPA methods included in "Test Methods for Evaluating Solid Waste" (SW-846, as amended; November, 1986) or other methods deemed satisfactory by the Department. If methods other than Department approved methods are to be used, Respondent shall submit all protocols to be used for analyses to the Department for approval within sixty (60) days prior to the commencement of analyses; and

b. Ensure that laboratories used by Respondent for analyses, participate in a quality assurance/quality control program equivalent to that which is followed by the Office of Solid and Hazardous Waste Management (OSHWM) of the Department. As part of such a program, and upon reasonable request by the Department, such laboratories shall submit quality assurance/quality control programs to the Department and perform analyses of samples provided by the Department to demonstrate the quality of the analytical data.

7. PUBLIC COMMENT AND PARTICIPATION

a. Upon approval by the Department of a Corrective Measures Study Final Report, the Department shall make both the RCRA Facility Investigation Final Report (or summary of report) and the Corrective Measures Study Final Report (or summary of report) available to the public for review and comment for at least twenty-one (21) days.

b. The Administrative Record will be available for public review at the OSHWM of the Department from 8:30 a.m. until 4:30 p.m., and the Lake County Health Department from 8:30 a.m. until 4:30 p.m., Monday through Friday.

8. ON-SITE AND OFF-SITE ACCESS

a. Department representatives, who are appropriately OSHA trained and trained by refinery personnel for the potential hazards that may be encountered in a refinery workplace, are authorized to enter the Facility or other areas where work under this Order is being conducted, at reasonable times during the effective dates of this Order for the purposes of, inter alia: talking with Facility personnel and contractors; inspecting records, operating logs, and contracts related to the Facility; reviewing the progress of the Respondent in carrying out the terms of the Order; conducting such tests, sampling or monitoring as the Department or its Project Coordinator deem necessary; using a camera, sound recording, or other documentary type equipment consistent with refinery safety rules for the purpose of monitoring activities being performed under this Order; and verifying the reports and data submitted to the Department by the Respondent. Respondent shall receive a copy of all photos, sound recordings, or other documentary information collected by the Department and may assert a confidentiality claim under IC-13-7-6-6. The Respondent shall permit such authorized persons to inspect and copy all records, files, photographs, documents, and other writings, including all sampling and monitoring data, over which the Respondent exercises control, that pertain to work undertaken pursuant to this Order. The Respondent shall comply with all approved health and safety plans. Persons with access to the immediate field work area shall comply with approved Health and Safety Plans and the requirements of 29 CFR 1910 as applicable. All persons entering the Whiting Refinery shall adhere to all refinery safety rules and procedures.

b. To the extent that work required by this Order must be done on property not owned or controlled by Respondent, Respondent shall use reasonable efforts to obtain site access agreements from the present owner(s) of such property within thirty (30) days of approval of any Workplan or required activity for which site access is required. Such agreements shall provide access for IDEM and authorized representatives of IDEM, as specified above. Reasonable efforts as used in this paragraph shall include, at a minimum, a certified letter from Respondent to the present

owners of such property requesting access agreements to permit Respondent and the Department and its authorized representatives to access such property. Any such access agreement shall be incorporated by reference into this Order. In the event that agreements for access are not obtained within the effective date of this Order, Respondent shall notify the Department within seven (7) days thereafter regarding both the efforts undertaken to obtain access and its failure to obtain such agreements.

c. Nothing in this section limits or otherwise affects the Department's right of access and entry pursuant to applicable law, including IC 13-7-5-3.

9. SAMPLING AND DATA, DOCUMENT AVAILABILITY

a. The Respondent shall submit to the Department the results of all sampling and/or tests or other data generated by, or on behalf of the Respondent, in accordance with the requirements of this Order and its Exhibits herein. The Department shall make available to the Respondent the results of sampling, including raw data, and/or tests or other data similarly generated by IDEM. IDEM agrees not to duplicate work or data which has been approved in accordance with Section F.5 above. Respondent may continue its investigation and interim measures work commenced prior to the effective date of this order.

b. Respondent shall notify the Department at least seven (7) days before engaging in any field activities, such as well drilling, installation of equipment, or sampling. In the case of emergency Interim Measures, Respondent shall notify the Department at the earliest possible time. At the request of the Department, Respondent shall provide the Department or its authorized representatives an opportunity to take split or duplicate samples of all samples collected by Respondent pursuant to this Order. Similarly, at the request of Respondent, the Department shall allow Respondent or its authorized representatives to take split or duplicate samples of all samples collected by the Department under this Order.

c. Respondent may assert a business confidentiality claim covering all or part of any information submitted to the Department or obtained by the Department from the Respondent or the Respondent's agent pursuant to this Order. Information determined to be confidential by the Department shall be disclosed only to the extent permitted by IC 13-7-6-6. If no such confidentiality claim accompanies the information when it is

submitted to the Department, or after the information is obtained by the Department from the Respondent or the Respondent's agent, it may be made available to the public by the Department without further notice to the Respondent. Respondent agrees not to assert any confidentiality claim with regard to any physical or analytical data collected in the execution of workplans conducted under this Order.

10. RECORD PRESERVATION

The Respondent agrees to preserve, during the pendency of this Agreement and for a minimum of ten (10) years after its termination, all records and documents (except for drafts) in the Respondent's possession or in the possession of its employees, agents, accountants, contractors, or attorneys which relate in any way of the subject matters covered by this Agreement, despite any document retention policy to the contrary. Upon request by IDEM, the Respondent shall make available to IDEM such records, or copies of any such records (except for records which are privileged as attorney/client or attorney work product).

11. PROJECT COORDINATOR

a. On or before the effective date of this Order, the Department and Respondent shall each designate a Project Coordinator. Respondent shall notify the Department in writing of the Project Coordinator it has selected. Each Project Coordinator shall be responsible for overseeing the implementation of this Agreed Order. The Department's Project Coordinator will be the Department's designated representative at the Facility. All communications between Respondent and the Department, and all documents, reports, approvals, and other correspondence concerning the activities performed pursuant to the terms and conditions of this Order, shall be directed through the Project Coordinators.

b. Respondent and the Department shall provide written notice to the other party prior to changing the Project Coordinator when possible; in any case, written notice will be provided of project coordinator changes to ensure a smooth continuation of work required by this Order.

c. If the Department determines that activities in compliance or noncompliance with the Order, have caused or may cause a release of hazardous waste, a constituent of a hazardous waste, or a pollutant or contaminant that constitutes an imminent threat to the public health or to the environment, the Department may order Respondent to stop further

implementation of this Order for such period of time as may be needed to abate any such release or threat and/or to undertake any action which the Department determines is necessary to abate such release or threat. In the event that such an order is given, all schedules of compliance will be delayed for the length of time such order is in effect.

d. The absence of the Department's Project Coordinator or the Respondent's project coordinator from the Facility shall not be cause for the stoppage of work.

12. NOTIFICATION

Unless otherwise specified, reports, correspondence, approvals, disapprovals, notices or other submissions relating to or required under this Order shall be in writing and shall be hand delivered (which includes overnight delivery services) or sent via certified mail to the Project Coordinators.

Six (6) copies of all documents to be submitted to the Department should be sent to:

Mr. Donald Stilz
Corrective Action Section
Office of Solid and Hazardous Waste Management
100 North Senate
P.O. Box 6015
Indianapolis, IN 46206-6015

Documents to be submitted to the Respondent should be sent to:

Mr. Kent Fase
Remediation Manager
Amoco Oil Company
Mail Code 242
2815 Indianapolis Boulevard
Whiting, IN 46394

13. DELAY IN PERFORMANCE/STIPULATED PENALTIES

a. Unless there has been a modification of a compliance date by the Department, or unless the Department determines that noncompliance with a compliance date is attributable to Force Majeure as defined below, in the event Respondent fails to meet any date for submission of a required report described in paragraphs 2. and 3. below, or the initiation of any action set forth in the workplans described herein, Respondent shall pay stipulated penalties as set forth below.

(1) For failure to commence work as prescribed in a compliance date established in an approved, final workplan: $100 per day for one

to seven days of delay and $250 per day for each day of delay thereafter;

(2) For failure to submit any preventative measures, RFI, CMS, remedial investigation, remedial action study, risk assessment, environmental assessment, or corrective measures evaluation draft and final workplans or reports at the time required pursuant to this Order or submissions of additional work as required under paragraph F.5.k of this Order: $100 per day for the first one to seven days of delay and $250 for each day of delay thereafter; and

(3) For failure to submit quarterly progress reports at the time required pursuant to this Order: $50 per day for the first one to seven days of delay and $100 per day for each day of delay thereafter;

b. All penalties shall begin to accrue on the date that complete performance is due or a violation occurs, and shall continue to accrue through the final day of correction of noncompliance. Nothing herein shall prevent the simultaneous accrual of separate penalties for separate violations of this Order.

c. All penalties owed to the Department under this Section shall be due within thirty (30) days of receipt of a notification of noncompliance except as noted in Paragraph 13.e. below. Such notification shall describe the noncompliance and shall indicate the amount of penalties due. Interest shall begin to accrue on the unpaid balance at the end of the thirty-day period at the prime rate as noted in the financial section of the Wall Street Journal on the date the penalty begins to accrue.

d. All penalties shall be payable by certified or cashier's check to the Indiana Environmental Special Fund and shall be remitted to:

Office of Solid and Hazardous Waste Management
Indiana Department of Environmental Management
100 North Senate
Indianapolis, IN 46206-7060

Attention: Cashier

All payments shall reference the name and EPA I.D. number of the Facility, the Respondent's name and address, and the Department cause number of this action (H-11187). Copies of the transmittal of payment shall be sent simultaneously to the Project Coordinator.

e. The stipulated penalties set forth in this Section do not preclude the Department from pursuing any other remedies or sanctions, other than monetary sanctions, which may be available to the Department by reason of Respondent's failure to comply with any of the requirements of this Order.

f. The Department may exercise its discretion in any instance and not demand payment of stipulated penalties where they might otherwise be due hereunder. In determining whether or not to exercise such discretion, the Department may consider Respondent's overall implementation of and adherence to this Order.

14. DISPUTE RESOLUTION

a. This Section shall apply to any dispute arising under any section of this Order, unless specifically excepted.

b. Within sixty (60) calendar days after IDEM receives a report, plan or other document submitted to it by Respondent under this Order, IDEM shall either approve of such report, plan or document or specify in a written notice to Respondent the alleged deficiencies thereof. Within sixty (60) calendar days following a meeting with IDEM to discuss such deficiencies, Respondent shall either correct the alleged deficiencies and resubmit said report, plan or document to IDEM or provide a written response to IDEM as to why the report, plan, or document should be approved.

c. The parties shall use their best efforts to resolve, in good faith, all disputes or differences of opinion informally. If, however, disputes arise concerning this Order (including any decision, approval, or disapproval by IDEM) which the parties are unable to resolve informally, the Respondent may present written notice of such dispute to IDEM and set forth specific points of dispute and the position of the Respondent. This written notice shall be submitted no later than fourteen (14) calendar days after the Respondent discovers the IDEM project manager and the Respondent's remediation manager are unable to resolve the dispute. The

Respondent's remediation manager or the Department's project manager will notify the other immediately by telephone or other appropriate methods of communication, prior to written notice, when it is believed the parties are unable to resolve a dispute.

d. IDEM shall provide a written response to the Respondent setting forth its position and the basis therefor. During the twenty-one (21) calendar days following the receipt of the response, the parties shall attempt to negotiate in good faith a resolution of their differences.

e. Following the expiration of the time periods described in the immediately preceding paragraph, if IDEM concurs with the position of the Respondent, the Respondent shall be notified in writing and this Order shall be modified to include any necessary extension of time or variances of work. If IDEM does not concur with the position of the Respondent, IDEM, through the Commissioner or her/his designate, shall resolve the dispute, based upon and consistent with the terms of this Order, and shall provide written notification of such resolution to the Respondent. Respondent retains its rights to judicial appeal and the dispute shall be resolved under IC 4-21.5-5.

f. The dates for submission of the reports, plans, and other documents required in this Order and the schedules and plans to be submitted hereunder do and will represent the parties' best professional judgement and are and will be based on available information. If, after a plan has been approved by IDEM, there is cause to modify that plan due to unforeseen circumstances, Respondent shall give written notification thereof to IDEM. Such notification shall include the proposed revision to the plan and the reasons therefor. After IDEM receives such notification, IDEM shall either approve of such proposed revision or specify in written notice to Respondent the alleged deficiencies thereof. Within twenty-one (21) calendar days of Respondent's receipt of such a notice of deficiency, Respondent shall either correct the alleged deficiencies and resubmit the notification or provide a written response to IDEM as to why the revision should be approved. The parties hereto shall act in good faith in attempting to resolve any such disputes. If the parties are unable to resolve their dispute within twenty-one (21) calendar days after Respondent's response to IDEM's notice of deficiency, either party may have this dispute resolved under IC 4-21.5.

g. Elements of work and any actions required as a result of such dispute

resolution shall immediately be incorporated, if necessary, into the appropriate plan or procedure, and into this Order. The Respondent shall proceed with all remaining work according to the modified plan or procedure.

15. RESERVATION OF RIGHTS

a. The Department and the Respondent each expressly reserve all rights and defenses that each may have, pursuant to any available legal authority unless expressly waived herein.

b. The Department hereby reserves all of its statutory and regulatory powers, authorities, rights, remedies, both legal and equitable, which may pertain to Respondent's failure to comply with any of the requirements of the Order, including without limitation the assessment of penalties under IC 13- 7 except as compromised in section 13 above. This Order shall not be construed as a covenant not to sue, release, waiver or limitation of any rights, remedies, powers and/or authorities, civil or criminal, which the Department has, or any other statutory, regulatory or common law enforcement authority of the State of Indiana except as to the actions ordered herein and completed satisfactorily.

c. Compliance by Respondent with the terms of this Order shall not relieve Respondent of its obligations to comply with IC 13-7, 329 IAC 3.1 or any other applicable local, state or federal laws and regulations.

d. The Department and the Respondent shall take all necessary steps to secure the approval and oversight of The United States Environmental Protection Agency - Region V (US EPA) in regard to the execution of this Order and its associated work plans.

e. This Order is not intended to be nor shall it be construed as a permit. This Order does not relieve Respondent of any obligation to obtain and comply with any local, state or federal permits.

f. The Department reserves the right to perform any portion of the work consented to herein or any additional site characterization, feasibility study, and response/corrective actions as it deems necessary to protect public health and the environment and to seek reimbursement of the costs of such actions.

16. FORCE MAJEURE

a. Respondent shall cause all work to be performed within the time limits set forth herein, unless performance is delayed by events which constitute a "Force Majeure". For purposes of this Order, a "Force Majeure" is defined as any event arising from causes not foreseeable or circumstances beyond the reasonable control of the Respondent which could not be overcome by due diligence and which delays performance of any obligations required by this Order. Such events do not include customary and foreseeable increased costs of performance, changed economic circumstances, or normal precipitation events. A failure to obtain required access to property of third parties, provided Respondent has exercised due diligence in attempting to obtain such access, which prohibits or delays performance shall be deemed a Force Majeure event. Respondent shall have the burden of proving all claims of Force Majeure.

b. The Respondent shall notify the Department by calling within three (3) business days and by writing no later than seven (7) calendar days after discovery of any event which the Respondent contends is a Force Majeure. Such notification shall describe the anticipated length of the delay, the cause or causes of the delay, the measures taken or to be taken by the Respondent to minimize the delay, and the timetable by which these measures will be implemented. The decision of whether an event is a Force Majeure shall be made by the Assistant Commissioner of the Office of Solid and Hazardous Waste or his/her designate. Said decision shall be immediately communicated to the Respondent.

c. To the extent that the delay is attributable to a Force Majeure, the time period for performance under this Order shall be extended for the time period of delay attributable to the event constituting the Force Majeure.

17. OTHER CLAIMS

Nothing herein is intended to release, discharge, or in any way affect any claims, causes of action or demands in law or equity which the parties may have against any person, firm, partnership or corporation not a party to this Order for any liability it may have arising out of, or relating in any way to the generation, storage, treatment, handling, transportation, release or disposal of any materials, hazardous substances, hazardous waste, hazardous waste constituents, contaminants, or pollutants at, to, or from the properties covered by this order.

The parties to this Order expressly reserve all rights, claims, demands and causes of action they may have against any and all other persons and entities who are not parties to this Order, and as to each other for matters not covered hereby.

18. OTHER APPLICABLE LAWS

All actions required to be taken pursuant to this Order shall be undertaken in accordance with the requirements of all applicable local, state and federal laws and regulations. Respondent shall obtain or cause its representatives to obtain all permits and approvals necessary under such laws and regulations.

19. INDEMNIFICATION OF THE STATE OF INDIANA

Respondent agrees to indemnify and save and hold harmless the State of Indiana, its agencies, departments, agents, and employees from any and all claims or causes of action arising from or on account of acts or omissions of Respondent or its agents, receivers, and trustees in carrying out activities required by this Order.

20. SUBSEQUENT MODIFICATION

a. This Order may only be amended by mutual agreement of the Department and Respondent. Such amendments shall be in writing, shall be signed by both parties, shall have as their effective date the date on which they are signed by the Department and shall be incorporated into this Order by reference.

b. Any reports, plans, specifications, schedules, and attachments required by this Order are, upon written approval by the Department, incorporated into this Order by reference.

c. No informal advice, guidance, suggestions, or comments by the Department regarding reports, plans, specifications, schedules, and any other writing submitted by Respondent will be construed as relieving Respondent of its obligation to obtain written approval, if and when required by this Order.

21. SEVERABILITY

If any provision or authority of this Order or the application of this Order to any party or circumstances is held by any judicial or administrative authority to be invalid, the application of such provisions to other parties or circumstances and the remainder of the Order shall remain in force and shall not be affected thereby.

22. REIMBURSEMENT OF OVERSIGHT COSTS

A third party shall review risk assessment(s) submitted by Respondent, and the Respondent shall pay for such review. The reviewer shall be chosen by IDEM after approval is given by Respondent. Approval by Respondent shall be based on the professional qualifications and experience in reviewing risk assessments, potential conflict of interest, cost, and other appropriate factors. The reviewer shall provide to IDEM and Respondent a written evaluation of the technical merits and validity of the risk assessment(s), as consistent with US EPA guidance.

23. TERMINATION AND SATISFACTION

The provisions of this Order shall be deemed satisfied upon Respondent's receipt of written notice from the Department that Respondent has demonstrated, to the satisfaction of the Department, that the terms of this Order, including any additional tasks determined by the Department to be required pursuant to this Order, or any continuing obligation or promises (e.g., Record Retention, Reservation of Rights) have been satisfactorily completed. Said notice shall not be unreasonably withheld.

24. EFFECTIVE DATE

The effective date of this Order shall be the date on which Respondent receives the Notice of Approval of this Agreed Order. Because this Order was entered with the consent of both parties, Respondent waives its right to request a public hearing pursuant to IC 4-21.5-3-7, and judicial review of the Order pursuant to IC 4-21.5-5.

IT IS SO AGREED AND ORDERED:

TECHNICAL RECOMMENDATION

BY: _____
Michael E. Sickels, Chief
Corrective Action Section
Indiana Department of
Environmental Management

DATE: 9/13/95

ATTORNEY FOR RESPONDENT

BY: Ronald J. Gann

TITLE: Attorney

DATE: 10/27/95

OFFICE OF LEGAL COUNSEL

BY: _____
Catherine A. Gibbs
Office of Legal Counsel
Indiana Department of
Environmental Management

DATE: 9/13/95

AMOCO OIL COMPANY

BY: _____

Daniel H. Wilson
TITLE: Manager of Whiting
Business Unit

DATE: 11/9/95

APPROVED BY THE INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT this 4th of Dec., 1995.

Kathy Prosser
Kathy Prosser, Commissioner
Indiana Department of Environmental
Management

CAUSE NO. H-11187
Total Pages: 3

EXHIBIT A
INTERIM MEASURES WORKPLAN

Amoco Oil Company, Whiting Refinery
2815 Indianapolis Blvd.
Whiting, Indiana

Respondent, shall prepare an Interim Measures Workplan. The workplan shall include the development of several plans which shall be prepared concurrently.

A. Interim Measures Objectives

The workplan shall specify the objectives of the interim measures, demonstrate how the interim measures will abate releases and threatened releases, and to the extent possible, be consistent and integrated with any long-term solution at the facility. The Interim Measures Workplan will include a discussion of the technical approach, engineering design, engineering plans, schedules, budget, and personnel. The workplan will also include a description of qualifications of personnel performing or directing the interim measures, including contractor personnel. This plan shall also document the overall management approach to the interim measures.

B. Relationship of Interim Measures to RCRA Facility Investigation

1. All Interim Measures activities shall be described in the RCRA Facility Investigation Description of Current Conditions (Task I of the RFI).

2. The RCRA Facility Investigation (RFI) Workplan shall incorporate all interim measure activities, under the Health and Safety Plan and the Community Relations Plan.

C. Reports

1. Workplan. The Respondent shall submit a draft Workplan as described above. The Workplan shall be finalized incorporating comments received on the draft submission.

2. Progress Reports. The Respondent shall provide the Department with signed monthly progress reports containing:

a. A description and estimate of the percentage of the Interim Measures completed;

b. Summaries of all findings;

c. Summaries of all changes made in the Interim Measures during the reporting period;

d. Summaries of all contacts with representatives of the local community, public interest groups, or State or local government agencies (other than the Department) during the reporting period;

e. Summaries of all problems or potential problems encountered during the reporting period;

f. Actions being taken to rectify problems;

g. Changes in personnel during the reporting period;

h. Projected work for the next reporting period; and

i. Copies of daily reports, inspection reports, laboratory/monitoring data, etc.

3. Interim Measures Implementation Report. At the completion of the Interim Measures project (except for long-term operations, maintenance, and monitoring), the Respondent shall submit a draft Interim Measures Implementation Report to the Department. The Report shall document that the project is consistent with Interim Measures objectives and that the Interim Measures are performing adequately. The Report shall include, but not be limited to the following elements:

a. Synopsis of the Interim Measures and certification of the design and construction;

b. Explanation of any modifications to the plan and why these were necessary to the project;

c. Listing of criteria, established before the Interim Measures were initiated, for judging the functioning of the Interim Measures and explanations of any modification to these criteria;

d. Results of Facility monitoring, indicating that the Interim Measures are meeting or exceeding the performance criteria; and

e. Explanation of any continuing operation and maintenance (including monitoring) to be undertaken at the Facility.

This report shall include all of the inspection summary reports, inspection data sheets, problem identification and corrective measure reports, block evaluation reports, photographic reporting data sheets, design engineers' reports, deviation from design and material specifications (with justifying documentation) and as-built drawings.

The Report shall be finalized, incorporating comments received on draft submissions.

At the completion of the interim measures, the Respondent shall submit to the Indiana Department of Environmental Management a report which documents all interim measure activities.

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Total Pages: 28

EXHIBIT B
SCOPE OF WORK FOR A RCRA FACILITY INVESTIGATION (RFI)

Amoco Oil Company, Whiting Refinery
2815 Indianapolis Blvd.
Whiting, Indiana

PURPOSE

The purpose of this RCRA Facility Investigation is to determine the nature and extent of releases of hazardous waste or hazardous waste constituents from regulated units, solid waste management units (SWMUs), and other areas at the facility and to gather all necessary data to support the Corrective Measures Study. Amoco Oil Company (Respondent), shall furnish all personnel, materials, and services necessary for, or incidental to, performing the RCRA remedial investigation.

SCOPE

The RCRA Facility Investigation consists of seven (7) tasks:

Task I: Description of Current Conditions

A. Facility Background
B. Nature and Extent of Contamination
C. Implementation of Interim Measures

Task II: Pre-Investigation Evaluation of Corrective Measure Technologies

Task III: RFI Workplan Requirements

A. Project Management Plan
B. Data Collection Quality Assurance Plan
C. Data Management Plan
D. Health and Safety Plan
E. Community Relations Plan

Task IV: Facility Investigation

A. Environmental Setting
B. Source Characterization
C. Contamination Characterization
D. Potential Receptor Identification

Task V: Investigation Analysis

A. Data Analysis
B. Protection Standards

Task VI: Laboratory and Bench-Scale Studies

Task VII: Reports

A. Preliminary and Workplan
B. Progress
C. Draft and Final

TASK I: DESCRIPTION OF CURRENT CONDITIONS

The Owner/Operator (Respondent) shall submit for approval by the Indiana Department of Environmental Management (Department) a report providing the background information pertinent to the facility, contamination, and interim measures as set forth below. The data gathered during any previous investigations or inspections and other relevant data shall be included.

A. Facility Background

The Owner/Operator's (Respondent's) report shall summarize the regional location, pertinent boundary features, general facility physiography, hydrogeology, and historical use of the facility for the treatment, storage or disposal of solid and hazardous waste. The Owner/Operator's (Respondent's) report shall include:

1. Maps depicting the following:

    a. General geographic location, at least encompassing a five (5) mile radius;

b. Property lines, with the owners of all adjacent property clearly indicated;

c. Topography and surface drainage (with a contour interval of one (1) foot and a scale of 1 inch = 100 feet) depicting all waterways, wetlands, floodplains, water features, drainage patterns, and surface-water containment areas;

d. All tanks, building, utilities, paved areas, easements, rights-of-way, and other features;

e. All solid or hazardous waste treatment, storage or disposal areas active after November 19, 1980;

f. All known past solid or hazardous waste treatment, storage or disposal areas regardless of whether they were active on November 19, 1980;

g. All past and present product and waste underground tanks or piping;

h. Surrounding land uses (residential, commercial, agricultural, recreational); and

i. The location of all residential, production and ground-water monitoring wells. These wells shall be clearly labeled and have ground and top of casing elevations and construction details included (include all known information on residential wells).

2. A history and description of ownership and operation, solid and hazardous waste generation, treatment, storage and disposal activities at the facility;

3. Approximate dates or periods of past product and waste spills, identification of the materials spilled, the amount spilled, the location where spilled, and a description of the response actions conducted (local, state, or federal response units or private parties), including any inspection reports or technical reports generated as a result of the response; and

4. A summary of past permits requested and/or received, any enforcement actions and their subsequent responses and a list of documents and studies prepared for the facility.

B. Nature and Extent of Contamination

The Owner/Operator (Respondent) shall prepare and submit for Department approval a preliminary report describing the existing information on the nature and extent of

contamination.

1. Where feasible, the Owner/Operator's (Respondent's) report shall summarize all possible source areas of contamination. This, at a minimum, should include all regulated units, solid waste management units, spill areas, and other suspected source areas of contamination. For each area, the Owner/Operator (Respondent) shall identify the following:

   a. Location of unit/area (which shall be depicted on a facility map);

   b. Quantities of solid and hazardous wastes handled;

   c. Hazardous waste or constituents; and

   d. Identification of areas where additional information is necessary.

2. The Owner/Operator (Respondent) shall prepare an assessment and description of the existing degree and extent of contamination. This should include:

   a. Available monitoring data and qualitative information on locations and levels of contamination at the facility;

   b. All potential migration pathways including information on geology, pedology, hydrogeology, physiography, hydrology, water quality, meteorology, and air quality; and

   c. The potential impacts on human health and the environment, including demography, ground-water and surface-water use, and land use.

C. Implementation of Interim Measures

Current and past interim measures are described in Exhibit I to the Agreed Order to which this Exhibit is attached. The Owner/Operator (Respondent's) report shall document any additional interim measures which were or are being undertaken at the facility. This shall include:

1. Objectives of the interim measures: how the measure is mitigating a potential threat to human health and the environment and/or is consistent with and integrated into any long term solution at the facility;

2. Design, construction, operation, and maintenance requirements;

3. Schedules for design, construction and monitoring; and

4. Schedule for progress reports.

TASK II: PRE-INVESTIGATION EVALUATION OF CORRECTIVE MEASURE TECHNOLOGIES

Prior to starting the facility investigation, the Owner/Operator (Respondent) shall submit to the Department a report that identifies the potential corrective measure technologies that may be used on-site or off-site for the containment, treatment, remediation, and/or disposal of contamination. This report shall also identify any field data that needs to be collected in the facility investigation to facilitate the evaluation and selection of the final corrective measure or measures (e.g., compatibility of waste and construction materials, information to evaluate effectiveness, treatability of wastes, etc.).

TASK III: RFI WORKPLAN REQUIREMENTS

The Owner/Operator (Respondent) shall prepare a RCRA Facility Investigation (RFI) Workplan. This RFI Workplan shall include the development of several plans, which shall be prepared concurrently. During the RCRA Facility Investigation, it may be necessary to revise the RFI Workplan to increase or decrease the detail of information collected to accommodate the facility specific situation. The RFI Workplan includes the following:

A. Project Management Plan

The Owner/Operator (Respondent) shall prepare a Project Management Plan which will include a discussion of the technical approach, schedules, budget, and personnel. The Project Management Plan will also include a description of qualifications of personnel performing or directing the RFI, including contractor personnel. This plan shall also document the overall management approach to the RCRA Facility Investigation.

B. Data Collection Quality Assurance Plan

The Owner/Operator (Respondent) shall prepare a plan to document all monitoring procedures: sampling, field measurements and sample analysis performed during the investigation to characterize the environmental setting, source, and contamination, so as to ensure that all information, data and resulting decisions are technically sound, statistically valid, and properly documented.

1. Data Collection Strategy

The strategy section of the Data Collection Quality Assurance Plan shall include but not be limited to the following:

a. Description of the intended uses for the data, and the necessary level of precision and accuracy for these intended uses;

b. Description of methods and procedures to be used to assess the precision, accuracy and completeness of the measurement data;

c. Description of the rationale used to assure that the data accurately and precisely represent a characteristic of a population, parameter variations at the sampling point, a process condition or an environmental condition. Examples of factors which shall be considered and discussed include:

(1) Environmental conditions at the time of sampling;

(2) Number of sampling points;

(3) Representativeness of selected media; and

(4) Representativeness of selected analytical parameters.

d. Description of the measures to be taken to assure that the following data sets can be compared to each other:

(1) RFI data generated by the Owner/Operator (Respondent) over same time period;

(2) RFI data generated by an outside laboratory or consultant versus data generated by the Owner/Operator (Respondent);

(3) Data generated by separate consultants or laboratories; and

(4) Data generated by an outside consultant or laboratory over same time period.

e. Details relating to the schedule and information to be provided in quality assurance reports. The reports should include but not be limited to:

(1) Periodic assessment of measurement data accuracy, precision, and completeness;

(2) Results of performance audits;

(3) Results of system audits;

(4) Significant quality assurance problems and recommended solutions; and

(5) Resolutions of previously stated problems.

2. Sampling

The sampling section of the Data Collection Quality Assurance Plan shall discuss:

a. Selecting appropriate sampling locations, depths, etc.;

b. Providing a statistically sufficient number of sampling sites;

c. Measuring all necessary ancillary data;

d. Determining conditions under which sampling should be conducted;

e. Determining which media are to be sampled (e.g., ground water, air, soil, sediment, etc.);

f. Determining all parameters to be measured and where;

g. Selecting the frequency of sampling and length of sampling period;

h. Selecting the types of sample (e.g., composites vs. grabs) and number of samples to be collected per sampling site;

i. The exact sampling procedures to be followed by sampling personnel from arrival to and departure from the sampling site, (be specific);

j. Measures to be taken to prevent contamination of the sampling equipment and cross contamination between sampling site;

k. Documenting field sampling operations and procedures, including;

(1) Documentation of procedures for preparation of reagents or supplies which become an integral part of the sample (e.g., filters, and absorbing reagents);

(2) Procedures and forms for recording the exact location and specific considerations associated with sample acquisition;

(3) Documentation of specific sample preservation method;

(4) Calibration of field devices;

(5) Collection of replicate samples (i.e., field duplicates);

(6) Submission of field-biased blanks, where appropriate;

(7) Potential interferences present at the facility;

(8) Construction materials and techniques, associated with monitoring wells and piezometers;

(9) Field equipment listing and sample containers;

(10) Sampling order; and

(11) Decontamination procedures.

l. Selecting appropriate sample containers;

m. Sample preservation; and

n. Chain-of-custody, including:

(1) Standardized field tracking reporting forms to establish sample custody in the field prior to and during shipment; and

(2) Pre-prepared sample labels containing all information necessary for effective sample tracking.

3. Field Measurements

The Field Measurements section of the Data Collection Quality Assurance Plan shall discuss:

a. Selecting appropriate field measurement locations, depths, etc.;

b. Providing a statistically sufficient number of field measurements;

c. Measuring all necessary ancillary data;

d. Determining conditions under which field measurement should be

conducted;

e. Determining which media are to be addressed by appropriate field measurement (e.g., ground water, air, soil, sediment, etc.);

f. Determining which parameters are to be measured and where;

g. Selecting the frequency of field measurement and length of field measurements period; and

h. Documenting field measurement operations and procedures, including:

(1) Procedures and forms for recording raw data and the exact location, time, and facility-specific considerations associated with the data acquisition;

(2) Calibration of field devices;

(3) Collection of replicate measurements;

(4) Submission of field-biased blanks, where appropriate;

(5) Potential interferences present at the facility;

(6) Construction materials and techniques associated with monitoring wells and piezometers used to collect field data;

(7) Field equipment listing;

(8) Order in which field measurements were made; and

(9) Decontamination procedures.

4. Sample Analysis

The Sample Analysis section of the Data Collection Quality Assurance Plan shall specify the following:

a. Chain-of-custody procedures, including:

(1) Identification of a responsible party to act as sample custodian at the laboratory facility authorized to sign for incoming field samples, obtain documents of shipment, and verify the data

entered onto the sample custody records;

(2) Provision for a laboratory sample custody log consisting of serially numbered standard lab-tracking report sheets; and

(3) Specification of laboratory sample custody procedures for sample handling, storage, and dispersement for analysis.

b. Sample storage procedures and storage times;

c. Sample preparation methods;

d. Analytical procedures, including:

(1) Scope and application of the procedure;

(2) Sample matrix;

(3) Potential interferences;

(4) Precision and accuracy of the methodology; and

(5) Method detection limits.

e. Calibration procedures and frequency;

f. Data reduction, validation and reporting;

g. Internal quality control checks, laboratory performance and systems audits and frequency, including:

(1) Method blank(s);

(2) Laboratory control sample(s);

(3) Calibration check sample(s);

(4) Replicate sample(s);

(5) Matrix-spiked sample(s);

(6) "Blind" quality control sample(s);

(7) Control charts;

(8) Surrogate samples;

(9) Zero and span gases;

(10) Reagent quality control checks; and

(11) Requests for laboratory audits.

h. Preventive maintenance procedures and schedules;

i. Corrective action (for laboratory problems); and

j. Turnaround time.

C. Data Management Plan

The Owner/Operator (Respondent) shall develop and initiate a Data Management Plan to document and track investigation data and results. This plan shall identify and set up data documentation materials and procedures, project file requirements, and project-related progress reporting procedures and documents. The plan shall also provide the format to be used to present the raw data and conclusions of the investigation.

1. Data Record

The data record shall include the following:

a. Unique sample or field measurement code;

b. Sampling or field measurement location and sample or measurement type;

c. Sampling or field measurement raw data;

d. Laboratory analysis ID number;

e. Property or component measured; and

f. Result of analysis (e.g., concentration).

2. Tabular Displays

The following data shall be presented in tabular displays:

a. Unsorted (raw) data;

b. Results for each medium, or for each constituent monitored;

c. Data reduction for statistical analysis;

d. Sorting of data by potential stratification factors (e.g., location, soil layer, topography); and

e. Summary data.

3. Graphical Displays

The following data shall be presented in graphical formats (e.g., bar graphs, line graphs, area or plan maps, isopleth plots, cross-sectional plots or transects, three dimensional graphs, etc.):

a. Sampling location and sampling grid;

b. Boundaries of sampling area, and areas where more data are required;

c. Levels of contamination at each sampling location;

d. Geographical extent of contamination;

e. Contamination levels, averages, and maxima;

f. Changes in concentration in relation to distance from the source, time, depth or other parameters; and

g. Features affecting intramedia transport and show potential receptors.

D. Health and Safety Plan

The Owner/Operator (Respondent) shall prepare a facility Health and Safety Plan.

1. Major elements of the Health and Safety Plan shall include:

a. Facility description including availability of resources such as roads,

water supply, electricity and telephone service;

b. Describe the known hazards and evaluate the risks associated with possible incidents and with each activity conducted;

c. List key personnel and alternates responsible for site safety, response operations, and for protection of public health;

d. Delineate work area;

e. Describe levels of protection to be worn by personnel in work area;

f. Establish procedures to control site access;

g. Describe decontamination procedures for personnel and equipment;

h. Establish site emergency procedures;

i. Address emergency medical care for possible injuries and toxicological problems;

j. Describe requirements for an environmental surveillance program;

k. Specify any routine and special training required for responders; and

l. Establish procedures for protecting workers from weather-related problems.

2. The facility Health and Safety Plan shall be consistent with:

a. NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985);

b. U.S. EPA Order 1440.1-Respiratory Protection;

c. U.S. EPA Order 1140.3-Health and Safety Requirements for Employees engaged in Field Activities;

d. Facility Contingency Plan;

e. U.S. EPA Standard Operating Safety Guide (1984);

f. OSHA regulations particularly in 29 CFR 1910 and 1926;

g. State and local regulations; and

h. Other Department or U.S. EPA guidance.

E. Community Relations Plan

The Owner/Operator (Respondent) shall prepare a plan, for the dissemination of information to the public regarding investigation activities and results.

TASK IV: FACILITY INVESTIGATION

The Owner/Operator (Respondent) shall conduct those investigations necessary to: Characterize the facility; define the source where practical and feasible; define the degree and extent of contamination; and identify actual or potential receptors.

The investigations should result in data of adequate technical quality to support the development and evaluation of the corrective measure alternative or alternatives during the Corrective Measures Study.

The site investigation activities shall follow the plans set forth in Task III. All sampling and analyses shall be conducted in accordance with the Data Collection Quality Assurance Plan. All sampling locations shall be documented in a log and identified on a detailed site map.

A. Environmental Setting

The Owner/Operator (Respondent) shall collect information to supplement and verify existing information on the environmental setting at the facility. The Owner/Operator (Respondent) shall characterize the following:

1. Hydrogeology

The Owner/Operator shall conduct a program to evaluate hydrogeologic conditions at the facility. This program shall provide the following information:

a. A description of the regional and facility specific geologic and hydrogeologic characteristics affecting ground water flow beneath the facility, including:

(1) Regional and facility-specific stratigraphy: description of strata including strike and dip, identification of stratigraphic contacts;

(2) Structural geology: description of local and regional structural features (e.g., folding, faulting, tilting, jointing, etc.);

(3) Depositional history;

(4) Identification and characterization of areas and amounts of recharge and discharge;

(5) Regional and facility-specific ground water flow patterns; and

(6) Characterize seasonal variations in the ground water flow regime.

b. An analysis of any topographic features that might influence the ground water flow system. (Note: Stereographic analysis of aerial photographs may aid in this analysis).

c. Based on field data, test, and cores, a representative and accurate classification and description of the hydrogeologic units which may be part of the migration pathways at the facility (i.e., the aquifers and any intervening saturated and unsaturated units), including:

(1) Hydraulic conductivity and porosity (total and effective);

(2) Lithology, grain size, sorting, degree of cementation;

(3) An interpretation of hydraulic interconnections or the lack thereof, between saturated zones; and

(4) The attenuation capacity and mechanisms of the natural earth materials (e.g., ion exchange capacity, organic carbon content, mineral content, etc.).

d. Based on field studies and cores, structural geology and hydrogeologic cross sections showing the extent (depth, thickness, lateral extent) of hydrogeologic units which may be part of the migration pathways identifying:

(1) Sand and gravel deposits in unconsolidated deposits;

(2) Zones of fracturing or channeling in consolidated or unconsolidated deposits;

(3) Zones of higher permeability or low permeability that might

direct and restrict the flow of contaminants;

(4) The uppermost aquifer: geologic formation, group of formations, or part of a formation capable of yielding a significant amount of ground water to wells or springs; and

(5) Water-bearing zones above the first confining layer that may serve as a pathway for contaminant migration including perched zones of saturation.

e. Based on data obtained from ground water monitoring wells and piezometers installed upgradient and downgradient of the potential contaminant source, a representative description of water level or fluid pressure monitoring including:

(1) Water-level contour and/or potentiometric maps;

(2) Hydrologic cross sections showing vertical gradients;

(3) The flow system, including the vertical and horizontal components of flow; and

(4) Any temporal changes in hydraulic gradients, (e.g., seasonal influences).

f. A description of manmade influences that may affect the hydrogeology of the site, identifying:

(1) Active and inactive local water-supply and production wells with an approximate rate and schedule of pumping; and

(2) Manmade hydraulic structures (pipelines, french drains, ditches, unlined ponds, septic tanks, NPDES outfalls, retention areas, etc.).

2. Soils

The Owner/Operator (Respondent) shall conduct a program to characterize the soil and rock units above the water table in the vicinity of the contaminant release(s). Such characterization shall include but not be limited to, the following information:

a. SCS soil classification;

b. Surface soil distribution;
c. Soil profile, including ASTM classification of soils;
d. Transects of soil stratigraphy;
e. Hydraulic conductivity (saturated and unsaturated);
f. Relative permeability;
g. Bulk density;
h. Porosity;
i. Soil sorptive capacity;
j. Cation exchange capacity (CEC);
k. Soil organic content;
l. Soil pH;
m. Particle size distribution;
n. Depth of water table;
o. Moisture content;
p. Effect of stratification on unsaturated flow;
q. Infiltration;
r. Evapotranspiration;
s. Storage capacity;
t. Vertical flow rate; and
u. Mineral content.

3. Surface Water and Sediment

The Owner/Operator (Respondent) shall conduct a program to characterize the surface-water bodies in the vicinity of the facility. Such characterization shall include, but not be limited to, the following activities and information:

a. Description of the intermittent and permanent surface-water bodies including:

(1) For lakes: location, elevation, surface area, in-flow, out-flow, depth, temperature stratification, and volume;

(2) For impoundments: location, elevation, surface area, depth, volume, freeboard, and purpose of impoundment;

(3) For streams, ditches, drains, swamps and channels: location, elevation, flow, velocity, depth, width, seasonal fluctuations, and flooding tendencies (i.e., 100 year and 500 year events):

(4) Drainage patterns; and

(5) Evapotranspiration.

b. Description of the chemistry of the natural surface water and sediments. This includes determining the pH, total dissolved solids, total suspended solids, biological oxygen demand, alkalinity, conductivity, dissolved oxygen profiles, nutrients (NH3, NO3-, PO4-3), chemical oxygen demand, total organic carbon, specific contaminant concentrations, etc.

c. Description of sediment characteristics including:

(1) Deposition area;

(2) Thickness profile; and

(3) Physical and chemical parameters (e.g., grain size, density, organic carbon content, ion exchange capacity, pH, etc.)

4. Air

The Owner/Operator (Respondent) shall provide information characterizing the climate in the vicinity of the facility. Such information shall include, but not be limited to:

a. A description of the following meteorological information:

(1) Annual and monthly rainfall averages;

(2) Monthly temperature averages and extremes;

(3) Wind speed and direction;

(4) Relative humidity/dew point;

(5) Atmospheric pressure;

(6) Evaporation data;

(7) Development of inversions; and

(8) Climate extremes that have been known to occur in the vicinity of the facility, including frequency of occurrence.

b. A description of topographic and manmade features which affect air flow and emission patterns, including:

(1) Ridges or hills;

(2) Valleys;

(3) Surface water bodies (e.g. rivers, lakes, ponds, etc.);

(4) Wind breaks and forests; and

(5) Buildings and related structures..

B. Source Characterization

Where practical and feasible, the Owner/Operator (Respondent) shall collect analytic data to completely characterize the wastes and the areas where wastes have been placed, collected or removed including: type; quantity; physical form; disposition (containment or nature of deposits); and facility characteristics affecting release (e.g., facility security, engineered barriers, etc.). This shall include quantification of the following specific characteristics, at each source area:

1. Unit/Disposal Area Characteristics:

a. Location of unit/disposal area;
b. Type of unit/disposal area;
c. Design features;
d. Operating practices (past and present);
e. Period of operation;
f. Age of unit/disposal area;
g. General physical conditions; and
h. Method used to close the unit/disposal area.

2. Waste Characteristics:

a. Type of waste placed in the unit;

(1) Hazardous classification (e.g., flammable, reactive, corrosive, oxidizing or reducing agent);

(2) Quantity; and

(3) Chemical composition.

b. Physical and chemical characteristics;

(1) Physical form (solid, liquid, gas);
(2) Physical description (e.g., powder, oily sludge);
(3) Temperature;
(4) pH;
(5) General chemical class (e.g., acid, base, solvent);
(6) Molecular weight;
(7) Density;
(8) Boiling point
(9) Viscosity;
(10) Solubility in water;
(11) Cohesiveness of the waste;
(12) Vapor pressure;
(13) Flash point.

c. Migration and dispersal characteristics of the waste;

(1) Sorption;
(2) Biodegradability, bioconcentration, biotransformation;
(3) Photodegradation rates;
(4) Hydrolysis rates; and
(5) Chemical transformations.

The Owner/Operator (Respondent) shall document the procedures used in making the above determinations.

C. Contamination Characterization

Where applicable, the Owner/Operator (Respondent) shall collect analytical data on ground water, soils, surface water, sediment, and subsurface gas contamination in the vicinity of the facility. This data shall be sufficient to define the extent, origin, direction, and rate of movement of contaminant plumes. Data shall include time and location of sampling, media sampled, concentrations found, and conditions during sampling, and the identity of the individuals performing the sampling and analysis. The Owner/Operator (Respondent) shall address the following types of contamination at the facility.

1. Ground Water Contamination

The Owner/Operator (Respondent) shall conduct a Ground Water Investigation to characterize any plumes of contamination at the facility. This investigation shall at a minimum provide the following information:

a. A description of the horizontal and vertical extent of any immiscible or dissolved plume(s) originating from the facility;

b. The horizontal and vertical direction of contamination movement;

c. The velocity of contaminant movement;

d. The horizontal and vertical concentration profiles of all hazardous waste constituents in the plume(s);

e. An evaluation of factors influencing the plume movement; and

f. An extrapolation of future contaminant movement.

The Owner/Operator (Respondent) shall document the procedures used in making the above determinations (e.g., well design, well construction, geophysics, modeling, etc.).

2. Soil Contamination

The Owner/Operator (Respondent) shall conduct an investigation to characterize the contamination of the soil and rock units above the water table in the vicinity of the contaminant release. The investigation shall include the following information:

a. A description of the vertical and horizontal extent of contamination.

b. A description of contaminant and soil chemical properties within the contaminant source area and plume. This includes contaminant solubility, specification, adsorption, leachability, exchange capacity, biodegradability, hydrolysis, photolysis, oxidation and other factors that might affect contaminant migration and transformation.

c. Specific contaminant concentrations.

d. The velocity and direction of contaminant movement.

e. An extrapolation of future contaminant movement.

The Owner/Operator (Respondent) shall document the procedures used in making the above determinations.

3. Surface-water and Sediment Contamination

The Owner/Operator shall conduct a surface-water investigation to characterize contamination in surface-water bodies resulting from contaminant releases at the facility.

The investigation shall include, but not be limited to, the following information:

a. A description of the horizontal and vertical extent of any immiscible or dissolved plume(s) originating from the facility, and the extent of contamination in underlying sediments;

b. The horizontal and vertical direction of contaminant movement;

c. The contaminant velocity;

d. An evaluation of the physical, biological and chemical factors influencing contaminant movement;

e. An extrapolation of future contaminant movement; and

f. A description of the chemistry of the contaminated surface waters and sediments. This includes determining the pH, total dissolved solids, specific contaminant concentrations, etc.

The Owner/Operator (Respondent) shall document the procedures used in making the above determinations.

4. Air Contamination

If relevant or applicable, the Owner/Operator (Respondent) shall conduct an investigation to characterize the particulate and gaseous contaminants released into the atmosphere. This investigation shall provide the following information:

a. A description of the horizontal and vertical direction and velocity of contaminant movement;

b. The rate and amount of the release; and

c. The chemical and physical composition of the contaminant(s) released, including horizontal and vertical concentration profiles.

The Owner/Operator (Respondent) shall document the procedures used in

making the above determinations.

5. Subsurface Gas Contamination

If relevant or applicable, the Owner/Operator (Respondent) shall conduct an investigation to characterize subsurface gases emitted from buried hazardous waste and hazardous constituents in the ground water. This investigation shall include the following information:

a. A description of the horizontal and vertical extent of subsurface gas migration;

b. The chemical composition of the gases being emitted;

c. The rate, amount, and density of the gases being emitted;

d. Horizontal and vertical concentration profiles of the subsurface gases emitted.

The Owner/Operator (Respondent) shall document the procedures used in making the above determinations.

D. Potential Receptors

The Owner/Operator (Respondent) shall collect data describing the human populations and environmental systems that are susceptible to contaminant exposure from the facility. Chemical analysis of biological samples may be needed. Data on observable effects in ecosystems may also be obtained. The following characteristics shall be identified.

1. Local uses and possible future uses of ground water:

a. Type of use (e.g., drinking water source: municipal or residential, agricultural, domestic/non-potable, and industrial); and

b. Location of ground water users including wells and discharge areas.

2. Local uses and possible future uses of surface waters draining the facility:

a. Domestic and municipal (e.g., potable and lawn/gardening watering);

b. Recreational (e.g., swimming, fishing);

c. Agricultural;

d. Industrial; and

e. Environmental (e.g., fish and wildlife propagation).

3. Human use of or access to the facility and adjacent lands, including but not limited to:

a. Recreation;

b. Hunting;

c. Residential;

d. Commercial;

e. Zoning; and

f. Relationship between population locations and prevailing wind direction.

4. A description of the biota in surface water bodies on, adjacent to, or affected by the facility.

5. A description of the ecology overlying and adjacent to the facility.

6. A demographic profile of the people who use or have access to the facility and adjacent land, including, but not limited to: age; sex; and sensitive subgroups.

7. A description of any endangered or threatened species near the facility.

TASK V: INVESTIGATION ANALYSIS

The Owner/Operator (Respondent) shall prepare an analysis and summary of all facility investigations and their results. The objective of this task shall be to ensure that the investigation data are sufficient in quality (e.g., quality assurance procedures have been followed) and quantity to describe the nature and extent of contamination, potential threat to human health and/or the environment, and to support the Corrective Measures Study. A risk assessment may be performed to determine the threat to human health and/or the environment and to support the corrective measures study. Human health risk assessments will be performed consistent with the United States Environmental Protection Agency (US EPA) Risk Assessment Guidance for Superfund (RAGS; US EPA, 1989A, 1989B), the US EPA Guidance for Exposure Assessment (US EPA, 1992A) and subsequently published appropriate exposure

and risk methods. Ecological risk assessments will be performed consistent with the EPA Framework for Ecological Risk Assessment (US EPA, 1992, EPA630/R-92/001).

A. Data Analysis

The Owner/Operator (Respondent) shall analyze all facility investigation data outlined in Task IV and prepare a report on the type and extent of contamination at the facility including sources and migration pathways. The report shall describe the extent of contamination (qualitative/quantitative) in relation to background levels indicative for the area.

B. Protection Standards

1. Ground Water Protection Standards

For regulated units the Owner/Operator (Respondent) shall provide information to support the Department's selection/development of Ground Water Protection Standards for all hazardous waste found in the ground water during the Facility Investigation (Task IV).

a. The Ground Water Protection Standards shall consist of:

(1) for any constituents listed in 329 IAC 3.1-10, the respective value given in that table (maximum level) if the background level of the constituent is below the given; or

(2) the background level of any constituent in the ground water; or

(3) a U.S. EPA approved Alternate Concentration Limit (ACL).

b. Information to support the U.S. EPA's subsequent selection of Alternate Concentration Limits (ACL's) shall be developed by the Owner/Operator (Respondent) in accordance with U.S. EPA guidance. For any proposed ACL's the Owner/Operator (Respondent) shall include a justification based upon the criteria set forth in 40 Code of Federal Regulations (CFR) 264.94(b).

c. Within thirty (30) days of receipt of the U.S. EPA's notification of disapproval of any proposed ACL, the Owner/Operator (Respondent) shall amend and submit revisions to the U.S. EPA.

2. Other Relevant Protection Standards

The Owner/Operator (Respondent) shall identify all relevant and applicable standards for the protection of human health and the environment (e.g. National Ambient Air Quality Standards, Federally-approved state water quality standards, etc.).

TASK VI: LABORATORY AND BENCH-SCALE STUDIES

The Owner/Operator (Respondent) shall conduct laboratory and/or bench scale studies to determine the applicability of a corrective measure technology or technologies to facility conditions. The Owner/Operator shall analyze the technologies, based on literature review, vendor contracts, and past experience to determine the testing requirements.

The Owner/Operator shall develop a testing plan identifying the type(s) and goal(s) of the study(ies), the level of effort needed, and the procedures to be used for data management and interpretation.

Upon completion of the testing, the Owner/Operator (Respondent) shall evaluate the testing results to assess the technology or technologies with respect to the site-specific questions identified in the test plan.

The Owner/Operator (Respondent) shall prepare a report summarizing the testing program and its results, both positive and negative.

TASK VII: REPORTS

A. Preliminary and Workplan

The Owner/Operator (Respondent) shall submit to the Department reports on Tasks I and II when it submits the RCRA Facility Investigation Workplan (Task III).

B. Progress

The Owner/Operator (Respondent) shall, at a minimum, provide the Department with signed quarterly progress reports containing:

1. A description and estimate of the percentage of the RFI completed;

2. Summaries of all findings;

3. Summaries of all changes made in the RFI during the reporting period;

4. Summaries of all contacts with representatives of the local community, public interest groups or State government during the reporting period;

5. Summaries of all problems or potential problems encountered during the reporting period;

6. Actions being taken to rectify problems;

7. Changes in personnel during the reporting period;

8. Projected work for the next reporting period; and

9. Copies of daily reports, inspection reports, laboratory/monitoring data, etc.

C. Draft and Final

Upon Department approval, the Owner/Operator (Respondent) shall prepare a RCRA Facility Investigation Report to present Tasks IV-V. The RCRA Facility Investigation Report shall be developed in draft form for Department review. The RCRA Facility Investigation Report shall be developed in final format incorporating comments received on the Draft RCRA Facility Investigation Report. Task VI shall be submitted as a separate report when the Final RCRA Facility Investigation Report is submitted.

Six (6) copies of all reports, including the Task I report, Task II report, Task III workplan, Task VI report and both the Draft and Final RCRA Facility Investigation Reports (Task IV-V) shall be provided by the Owner/Operator (Respondent) to the Department.

Facility Submission Summary

A summary of the information reporting requirements contained in the RCRA Facility Investigation Scope of Work is presented below:

Facility Submission	**Due Date**
Description of Current Situation (Task I)	90 days from finalization of Order
Pre-Investigation Evaluation of Corrective Measure technologies (Task II)	90 days from finalization of Order

RFI Workplan (Task III)	180 days from finalization of Order
Draft RFI Report (Tasks IV and V)	per workplan schedule
Final RFI Report (Tasks IV and V)	30 days after Department Comment on Draft RFI Report
Progress Reports on Tasks I through VI	QUARTERLY
Preventative Measures Plan	180 days after finalization of Order
Preventative Measures Report	180 days after Department approval of the plan

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Total Pages: 12

EXHIBIT C
SCOPE OF WORK FOR A CORRECTIVE MEASURE STUDY

Amoco Oil Company, Whiting Refinery
2815 Indianapolis Blvd.
Whiting, Indiana

PURPOSE

The purpose of this Corrective Measure Study (CMS) is to ensure that Amoco Oil Company (Respondent) develops and evaluates the corrective action alternative or alternatives and to recommend the corrective measure or measures to be taken at the facility. The Owner/Operator (Respondent) will furnish the personnel, materials, and services necessary to prepare the corrective measure study, except as otherwise specified.

SCOPE

The Corrective Measure Study consists of four tasks:

Task VIII: Identification and Development of the Corrective Measure Alternative or Alternatives

A. Description of Current Situation
B. Establishment of Corrective Action Objectives
C. Screening of Corrective Measures Technologies
D. Identification of the Corrective Measure Alternative or Alternatives

Task IX: Evaluation of the Corrective Measure Alternative or Alternatives

A. Technical/Environmental/Human Health/Institutional
B. Cost Estimate

Task X: Justification and Recommendation of the Corrective Measure or Measures

A. Technical
B. Environmental
C. Human Health

Task XI: Reports

A. Progress
B. Draft
C. Final

TASK VIII: IDENTIFICATION AND DEVELOPMENT OF THE CORRECTIVE ACTION ALTERNATIVE OR ALTERNATIVES

Based on the results of the RCRA Facility Investigation and consideration of the identified Preliminary Corrective Measure Technologies (Task II), the Owner/Operator (Respondent) shall identify, screen and develop the alternative or alternatives for removal, containment, treatment and/or other remediation of the contamination based on the objectives established for the corrective action.

A. Description of Current Situation

The Owner/Operator (Respondent) shall submit to the Indiana Department of Environmental Management (Department), an update to the information describing the current situation at the facility and the known nature and extent of the contamination as documented by the RCRA Facility Investigation Report. The Owner/Operator (Respondent) shall provide an update to information presented in Task I of the RFI to the Department regarding previous response activities and any interim measures which have been or are being implemented at the facility. The Owner/Operator (Respondent) shall also make a facility-specific statement of the purpose for the response, based on the results of the RCRA Facility Investigation. The statement of purpose should identify the actual or potential exposure pathways that should be addressed by corrective measures.

B. Establishment of Corrective Action Objectives

The Owner/Operator (Respondent), in conjunction with the Department, shall establish site. Specific objectives for the corrective action. These objectives shall be based on public health and environmental criteria, information gathered during the RCRA Facility Investigation, EPA guidance, and the requirements of any applicable State or Federal statutes. At a minimum, all corrective actions concerning ground water releases from regulated units must be consistent with, and as stringent as, those required under 329 IAC 3.1-9, (40 CFR 264.100).

C. Screening of Corrective Measure Technologies

The Owner/Operator (Respondent) shall review the results of the RCRA Facility

Investigation and reassess the technologies specified in Task II and to identify additional technologies which are applicable at the facility. The Owner/Operator (Respondent) shall screen the preliminary corrective measure technologies identified in Task II of the RCRA Facility Investigation and any supplemental technologies to eliminate those that may prove infeasible to implement, that rely on technologies unlikely to perform satisfactorily or reliably, or that do not achieve the corrective measure objective within a reasonable time period. This screening process focuses on eliminating those technologies which have severe limitations for a given set of waste and site-specific conditions. The screening step may also eliminate technologies based on inherent technology limitations.

Site, waste, and technology characteristics which are used to screen inapplicable technologies are described in more detail below:

1. Site Characteristics

   Site data should be reviewed to identify conditions that may limit or promote the use of certain technologies. Technologies whose use is clearly precluded by site characteristics should be eliminated from further consideration;

2. Waste Characteristics

   Identification of waste characteristics that limit the effectiveness or feasibility of technologies is an important part of the screening process. Technologies clearly limited by these waste characteristics should be eliminated from consideration. Waste Characteristics particularly affect the feasibility of in-situ methods, direct treatment methods, and land disposal (on/off-site); and

3. Technology Limitations

   During the screening process, the level of technology development, performance record, and inherent construction, operation, and maintenance problems should be identified for each technology considered. Technologies that are unreliable, perform poorly, or are not fully demonstrated may be eliminated in the screening process. For example, certain treatment methods have been developed to a point where they can be implemented in the field without extensive technology transfer or development.

D. Identification of the Corrective Measure Alternative or Alternatives

The Owner/Operator (Respondent) shall develop the Corrective Measure Alternative or Alternatives based on the corrective action objectives and analysis of Preliminary

Corrective Measure Technologies, as presented in Task II of the RCRA Facility Investigation and as supplemented following the preparation of the RFI Report. The Owner/Operator (Respondent) shall rely on engineering practice to determine which of the previously identified technologies appear most suitable for the site. Technologies can be combined to form the overall corrective action alternative or alternatives. The alternative or alternatives developed should represent a workable number of option(s) that each appear to adequately address all site problems and corrective action objectives. Each alternative may consist of an individual technology or a combination of technologies. The Owner/Operator (Respondent) shall document the reasons for excluding technologies, identified in Task II, as supplemented in the development of the alternative or alternatives.

TASK IX: EVALUATION OF THE CORRECTIVE MEASURE ALTERNATIVE OR ALTERNATIVES

The Owner/Operator (Respondent) shall describe each corrective measure alternative that passes through the Initial Screening in Task VIII and evaluate each corrective measure alternative and its components. The evaluation shall be based on technical, environmental, human health and institutional concerns. The Owner/Operator (Respondent) shall also develop cost estimates of each corrective measure.

A. Technical/Environmental/Human Health/Institutional

The Owner/Operator (Respondent) shall provide a description of each corrective measure alternative which includes but is not limited to the following: preliminary process flow sheets; preliminary sizing and type of construction for buildings and structures; and rough quantities of utilities required. The Owner/Operator (Respondent) shall evaluate each alternative in the four following areas:

1. Technical;

   The Owner/Operator (Respondent) shall evaluate each corrective measure alternative based on performance, reliability, implementability and safety.

   a. The Owner/Operator (Respondent) shall evaluate performance based on the effectiveness and useful life of the corrective measure:

      (1) Effectiveness shall be evaluated in terms of the ability to perform intended functions, such as containment, diversion, removal, destruction, or treatment. The effectiveness of each corrective measure shall be determined either through design specifications or by performance evaluation. Any specific waste or site

characteristics which could potentially impede effectiveness shall be considered. The evaluation should also consider the effectiveness of combinations of technologies; and

(2) Useful life is defined as the length of time the level of effectiveness can be maintained. Most corrective measure technologies, with the exception of destruction, deteriorate with time. Often, deterioration can be slowed through proper system operation and maintenance, but the technology eventually may require replacement. Each corrective measure shall be evaluated in terms of the projected service lives of its component technologies. Resource availability in the future life of the technology, as well as appropriateness of the technology, must be considered in estimating the useful life of the project.

b. The Owner/Operator (Respondent) shall provide information on the reliability of each corrective measure including their operation and maintenance requirements and their demonstrated reliability:

(1) Operation and maintenance requirements include the frequency and complexity of necessary operation and maintenance. Technologies requiring frequent or complex operation and maintenance activities should be regarded as less reliable than technologies requiring little or straightforward operation and maintenance. The availability of labor and materials to meet these requirements shall also be considered; and

(2) Demonstrated and expected reliability is a way of measuring the risk and effect of failure. The Owner/Operator (Respondent) should evaluate whether the technologies have been used effectively under analogous conditions; whether the combination of technologies have been used together effectively; whether failure of any one technology has an immediate impact on receptors or the other technologies; and whether the corrective measure has the flexibility to deal with uncontrollable changes at the site.

c. The Owner/Operator (Respondent) shall describe the implementability of each corrective measure including the relative ease of installation (constructability) and the time required to achieve a given level of response:

(1) Constructability is determined by conditions both internal and

criteria, standards, or guidelines acceptable to the Department.

4. Institutional.

The Owner/Operator (Respondent) shall assess relevant institutional needs for each alternative. Specifically, the effects of federal, state and local environmental and public health standards, regulations, guidance, advisories, ordinances, or community relations on the design, operation, and timing of each alternative.

B. Cost Estimate

The Owner/Operator (Respondent) shall develop an estimate of the cost of each corrective measure alternative (and for each phase or segment of the alternative). The cost estimate shall include both capital and operation and maintenance costs.

1. Capital costs consist of direct (construction) and indirect (nonconstruction and overhead) costs.

a. Direct capital costs include:

(1) Construction costs: Costs of materials, labor (including fringe benefits and worker's compensation), and equipment required to install the corrective measure.

(2) Equipment costs: Costs of treatment, containment, disposal and/or service equipment necessary to implement the action; these materials remain until the corrective action is complete;

(3) Land and site-development costs: Expenses associated with purchase of land and development of existing property; and

(4) Buildings and services costs: Costs of process and nonprocess buildings, utility connections, purchased services, and disposal costs.

b. Indirect capital costs include:

(1) Engineering expenses: Costs of administration, design, construction supervision, drafting, and testing of corrective measure alternatives;

escrow funds to cover (1) costs of anticipated replacement or rebuilding of equipment and (2) any large unanticipated operation and maintenance costs; and

i. Other costs: Items that do not fit any of the above categories.

TASK X: JUSTIFICATION AND RECOMMENDATION OF THE CORRECTIVE MEASURE OR MEASURES

The Owner/Operator (Respondent) shall justify and recommend a corrective measure alternative using technical, human health, and environmental criteria. This recommendation shall include summary tables which allow the alternative or alternatives to be understood easily. Tradeoffs among health risks, environmental effects, and other pertinent factors shall be highlighted. The Department will select the corrective measure alternative or alternatives to be implemented based on the results of Tasks IX and X. At a minimum, the following criteria will be used to justify the final corrective measure or measures.

A. Technical

1. Performance - corrective measure or measures which are most effective at performing their intended functions and maintaining the performance over extended periods of time will be given preference;

2. Reliability - corrective measure or measures which do not require frequent or complex operation and maintenance activities and that have proven effective under waste and facility conditions similar to those anticipated will be given preference;

3. Implementability - corrective measure or measures which can be constructed and operated to reduce levels of contamination to attain or exceed applicable standards in the shortest period of time will be preferred; and

4. Safety - corrective measure or measures which pose the least threat to the safety of nearby residents and environments as well as workers during implementation will be preferred.

B. Human Health

The corrective measure or measures must comply with existing Department and U.S. EPA criteria, standards, or guidelines for the protection of human health. Corrective measures which provide the minimum level of exposure to contaminants and the maximum reduction in exposure with time are preferred.

C. Environmental

The corrective measure or measures posing the least adverse impact (or greatest improvement) over the shortest period of time on the environment will be favored.

TASK XI: REPORTS

The Owner/Operator (Respondent) shall prepare a Corrective Measure Study Report presenting the results of Task VIII through X and recommending a corrective measure alternative. Six (6) copies of the preliminary report shall be provided by the Owner/Operator (Respondent).

A. Progress

The Owner/Operator (Respondent) shall at a minimum provide the Department with signed, monthly progress reports containing:

1. A description and estimate of the percentage of the CMS completed;
2. Summaries of all findings;
3. Summaries of all changes made in the CMS during the reporting period;
4. Summaries of all contacts with representatives of the local community, public interest groups or State government during the reporting period;
5. Summaries of all problems or potential problems encountered during the reporting period;
6. Actions being taken to rectify problems;
7. Changes in personnel during reporting periods;
8. Projected work for the next reporting period; and
9. Copies of daily reports, inspection reports, laboratory/monitoring data, etc.

B. Draft

The report shall at a minimum include:

1. A description of the facility;
    a. Site topographic map and preliminary layouts.

Six (6) copies of the draft shall be provided by the Owner/Operator (Respondent) to the Department.

C. Final

The Owner/Operator (Respondent) shall finalize the Corrective Measure Study Report incorporating comments received from the Department on the Draft Corrective Measure Study Report.

Facility Submission Summary

A summary of the information reporting requirements contained in the Corrective Measure Study Scope of Work is presented below:

Facility Submission	Due Date
CMS Study Plan	90 days after approval of the RFI Final Report
Draft CMS Report (Tasks VIII, IX, and X)	As scheduled in CMS Study Plan
Final CMS Report (Tasks VIII, IX, and X)	30 days after Department Comment on Draft CMS
Progress Reports on Tasks VIII, IX and X	Monthly

CAUSE NO. H-11187
Total Pages: 17

EXHIBIT D
AGREEMENT PURSUANT TO INDIANA PETROLEUM RELEASE LAW IC 13-7-20.1 FOR A FACILITY INVESTIGATION FOR A PETROLEUM RELEASE

Amoco Oil Company, Whiting Refinery
2815 Indianapolis Blvd.
Whiting, Indiana

I. INTRODUCTION

1. The Indiana Department of Environmental Management (IDEM), by its Commissioner, having determined that a release of petroleum has occurred and the parties hereto being desirous of entering into an Agreement for the purpose of carrying out a remedial investigation and remedial action study with respect to such release and without the need for resorting to litigation, the parties agree to the following terms and conditions pursuant to Indiana Code (IC) 13-7.

II. JURISDICTION

2. This Agreement is entered into by and between the IDEM, by its Commissioner, and Amoco Oil Company (Respondent), pursuant to IC 13-7-20.1.

3. The Respondent agrees to undertake the actions required by the terms and conditions of this Agreement, under the terms of the Agreed Order to which this Exhibit is attached.

4. In agreeing to the issuance of and entering into this Agreement, the Respondent does not admit liability.

III. NOTICE OF ACTION

5. The Commissioner hereby determines that the action called for in this Agreement shall be performed properly by the Respondent.

IV. DEFINITIONS

6. "Owner or Operator" means for a petroleum facility a person who owns or operates the facility as defined in IC 13-7-20.1-3(a)(1).

7. "Petroleum" includes petroleum and crude oil or any part of petroleum and crude oil that is liquid at standard conditions of temperature and pressure (Sixty degrees Fahrenheit) and fourteen and seven tenths (14.7) pounds per square inch absolute as defined in IC 13-7-20.1-4.

8. "Petroleum Facility" means a site or an area on which petroleum has been deposited, stored, disposed of, placed, or located as defined in IC 13-7-20.1-5.

9. "Release" means a spill, leak, emission, discharge, escape, leaching of, disposing of petroleum into groundwater, surface water, subsurface water, or surface soils as defined in IC 13-7-20.1-7.

V. STATEMENT OF PURPOSE

10. The mutual objectives of IDEM and Respondent are: (a) to take measures as necessary to protect human health and the environment and to continue the recovery of petroleum from the subsurface environment; (b) to further determine the nature and extent of the potential impact (if any), on the public health and welfare, or the environment, caused by past releases of petroleum from the Petroleum Facility by conducting a remedial investigation; (c) to evaluate the nature of releases from Areas of Concern (AOCs) at the Petroleum Facility, including pipe alleys, the process sewer system, diked areas around tanks, and former underground tank sites; and (d) to identify and evaluate alternatives for remedial action to prevent, mitigate or otherwise respond to or remedy any past release of petroleum from the Petroleum Facility by conducting a remedial action study. Amoco (Respondent) shall furnish all personnel, materials, and services necessary for or incidental to performing these activities.

11. The activities conducted by the Respondent under this Agreement are subject to approval by IDEM, under the terms of the Agreed Order of which this is an Exhibit. Respondent shall provide all necessary information for a remedial investigation/remedial action study for the Petroleum Facility and affected areas contiguous to the Petroleum Facility and propose for IDEM's review and approval remedial measures. The activities conducted by the Respondent shall be consistent with the scopes of work attached as Exhibits to the Agreed Order to which this Agreement is attached to the extent that the elements of said Exhibits are relevant and appropriate, the Agreed Order to which this Agreement is attached, and all applicable laws and regulations as appropriate. Respondent shall employ sound scientific, engineering, and construction practices.

VI. FINDINGS OF FACT

12. Based upon information available on the effective date of this Agreement, the Commissioner of IDEM makes the following findings of fact:

A. IDEM is a duly authorized agency of the State of Indiana, created by the act of the legislature.

B. IDEM has jurisdiction of matters involving underground petroleum cleanups under the authority of IC 13-7-20.1.

C. Amoco submitted a refinery-wide groundwater investigation workplan to IDEM entitled "Refinery Area Workplan; Groundwater Investigation; Whiting, Indiana Refinery; Amoco Oil Company" in November of 1989, which was subsequently approved by IDEM on July 12, 1990.

D. Amoco met with IDEM, the Indiana State Board of Health, other applicable regulatory agencies, local, state, and federal officials and other interested parties on January 23, 1991, to discuss the results of Amoco's preliminary investigation of the Refinery.

E. Amoco submitted an offsite area groundwater investigation workplan to IDEM entitled, "Refinery Area Offsite Investigation Workplan; Whiting, Indiana Refinery; Amoco Oil Company" in February of 1991.

VII. CONCLUSIONS OF LAW

13. Based upon the information available on the effective date of this Agreement, the Commissioner of IDEM makes the following conclusions of law:

A. The Respondent is an owner or operator of a Petroleum Facility.

B. There has been a release of petroleum at the Petroleum Facility.

C. The Respondent is a "responsible person" as defined by IC 13-7-20.1-6.

D. The Commissioner may enter into an Agreement pursuant to IC 13-7-20.1-8.

VIII. WORK TO BE PERFORMED

14. IDEM agrees not to require Respondent to duplicate work which was previously conducted under generally accepted scientific methodologies, and in accordance with U.S. EPA SW 846 methodologies or other EPA accepted methods, or the July 1990 Workplan. Respondent may continue its investigation and interim measures and work commenced prior to the effective date of this Agreement. This does not prohibit IDEM from requiring and requesting additional or supplemental work which is appropriate and in direct support of the Workplan.

15. All work to be performed by the Respondent pursuant to this Agreement shall be reviewed and approved by a Certified Professional Engineer or Certified Professional Geologist. The Respondent shall notify IDEM, in writing, regarding the name and title of such engineer or geologist and of any contractors and/or subcontractors to be used in carrying out the terms of this Agreement. This person will not necessarily be the Respondent's Remediation Manager or Project Manager.

IX. RECENT AMOCO ACTIVITIES

16. Respondent represents that it has hired a consultant to perform certain remedial investigation activities in accordance with this Agreement covering the Petroleum Facility and the offsite area. Under Respondent's direction, the consultant has conducted a comprehensive field investigation of the nature and extent of past petroleum releases. Preliminary results were shared with IDEM in January, 1991. Respondent has also provided reports to IDEM subsequent to that time, providing, among other information, the location of existing groundwater monitoring wells and describing groundwater quality within the Petroleum Facility. Under Respondent's direction, the consultant has conducted a comprehensive field investigation of the offsite area from February, 1991 to the present to determine the nature and extent of past petroleum releases.

X. PETROLEUM FACILITY ASSESSMENT STATEMENT OF WORK

17. Preventative Measures

a. Within one-hundred-eighty (180) days of the effective date of the Agreed Order to which this Agreement is attached, Respondent shall submit to the Department a plan to implement those Preventative Measures identified in the attachment to this Agreement. The plan shall identify the structural designs and methods of implementation of measures identified as being necessary to prevent future releases to the environment. The Department will review this plan and will either approve the plan or provide written notice of alleged deficiencies. If the Department returns to the Respondent a written notice of alleged deficiencies in the plan, the Respondent shall, within sixty (60) days after receiving notice of such deficiencies, either modify the workplan in accordance with the notice, or within fifteen (15) days of such notice of deficiencies, request a meeting to discuss said deficiencies. The Respondent shall, within forty-five (45) days after meeting with the Department to discuss such deficiencies, submit a revised workplan to the Department which addresses the alleged deficiencies.

b. Within ninety (90) days of approval of the preventative measures plan, the Respondent shall implement the plan. Within one-hundred-eighty (180) days of approval of the preventative measures plan, the Respondent shall submit to the Department a final report on the implementation of the required preventative

measures. The final report will detail the work completed and the plans and schedules for any required routine inspections and actions. The Department will review this final report and will either approve it or provide written notice of alleged deficiencies. If the Department returns to the Respondent a written notice of alleged deficiencies in the final report, the Respondent shall, within sixty (60) days after receiving notice of such deficiencies, either modify the report in accordance with the notice, or within fifteen (15) days of such notice of deficiencies, request a meeting to discuss said deficiencies. The Respondent shall, within forty-five (45) days after meeting with the Department to discuss such deficiencies, submit a revised report to the Department which addresses the alleged deficiencies. Upon approval of the final report, the Respondent will have completed the Preventative Measures requirements of this Agreed Order and is bound to continue those routine measures identified in the final report. During implementation of these preventative measures, Respondent may propose modifications to the plan based on new data, changed conditions, and/or other good cause.

18. Interim Measures

a. Respondent is currently operating and has in the past operated a series of remediation systems at the Petroleum Facility. These systems include subsurface sheet pile barrier systems, french drain systems, wellpoint systems, recovery wells, and a pilot bioventing system. Details of these systems are attached as Exhibit I to the Agreed Order to which this Agreement is an Exhibit.

b. Respondent will continue to operate the remediation systems presented in Exhibit I that mitigate the offsite migration of petroleum from the Petroleum Facility so long as necessary to control such migration, and Respondent will build additional remediation systems and modify existing remediation systems as necessary to prevent future offsite migration of petroleum from the Petroleum Facility.

c. Respondent will continue to operate remediation systems presented in Exhibit I that remove petroleum from the subsurface within the boundaries of the Facility so long as they maintain efficient petroleum recovery. Respondent will take additional steps to extract petroleum from the subsurface within the boundaries of the Petroleum Facility by means of recovery wells, french drains, well point systems or any other approved method. Recovery systems will be situated so as to most effectively draw on areas of the highest levels of subsurface petroleum as determined on the basis of past, present, and future subsurface investigations at the Petroleum Facility. As data on subsurface conditions become of such quality that removal systems can be efficiently situated, Respondent will design and build such systems. Within one-hundred-eighty (180) days of the effective date of the Agreed Order to which this Agreement is attached, Respondent will submit a

workplan for implementing additional petroleum recovery operations. The workplan will specifically contain, but not be limited to, evaluation of product recovery systems for the following areas:

1. The product plume in the eastern part of the refinery (near 12 pipestill), commonly referred to as the 12 Pipestill plume.

2. The area of greater product thickness near the MEK process unit in the northwestern part of the refinery.

3. The area of greater product thickness on the Buffalo Side of the Facility (north of Standard Avenue).

The workplan will contain a schedule for implementation. During implementation of the workplan, Respondent may propose modifications to the plan based on new data, changed conditions, remediation system experience, and/or other good cause.

d. If the Petroleum Investigation indicates the presence of off-site petroleum releases, recovery systems will be installed to address these off-site areas. Respondent will submit the plans for such recovery systems to the Department for review.

19. Phase I Investigation Work Plans

A. Respondent submitted work plans (hereinafter referred to as "Phase I Workplans") for the Petroleum Facility and offsite areas to IDEM for review with a request for approval which proposed an initial remedial investigation for the Petroleum Facility and offsite areas in November of 1989 ("Refinery Area Workplan; Groundwater Investigation; Whiting, Indiana Refinery; Amoco Oil Company") and February 1991 ("Refinery Area Offsite Investigation Workplan; Whiting, Indiana Refinery; Amoco Oil Company"). IDEM approved the November 1989 workplan entitled "Refinery Area Workplan; Groundwater Investigation; Whiting, Indiana Refinery; Amoco Oil Company" on July 12, 1990.

B. The Phase I workplans focused on determining the nature and extent of the effects of past petroleum releases on the groundwater at the Petroleum Facility. The Phase I Investigation included installation of groundwater monitoring wells, sampling and analysis of groundwater at new and existing groundwater monitoring wells that did not contain free phase petroleum, sampling and analysis of underground petroleum on the groundwater, and selective soil sampling.

C. The Phase I workplans called for Respondent to analyze groundwater samples for four classes of priority pollutants including heavy metals, volatile organics, acid extractibles, and base neutrals. Selected soil samples were analyzed for the same

list of parameters as well as Total Petroleum Hydrocarbons (TPH) and physical properties.

D. The Phase I workplans included schedules for the proposed activities and a projected date for submission of a final report to IDEM giving the results of the Phase I Investigation and the interpretation of these results. The final report was provided to IDEM in July of 1991.

E. The Phase I workplans included health and safety plans for the work covered therein.

20. Phase II Investigation Work Plans

A. Within ninety (90) calendar days following IDEM written approval of the Phase I Investigation final reports (Refinery Area Groundwater Investigation Report and Offsite Area Groundwater Investigation Report), Respondent shall submit two work plans, one for the Petroleum Facility and the other for the offsite area currently under investigation, to IDEM for written approval, to formalize approval for and to propose a remedial investigation for the Petroleum Facility and the offsite area (Phase II Investigation Work Plan), some activities of which are already underway. The Phase II Investigation Work Plan shall focus on further defining the nature and extent of dissolved underground petroleum in the groundwater. The petroleum releases may have in part come from the following Areas of Concern: the Facility process sewer system, the pipe alleys throughout the Refinery, diked areas around tanks, and the sites of former underground tanks. The Phase II Investigation Work Plan may include, but not be limited to, installation of additional groundwater monitoring wells, as needed, and sampling and analysis of the water and underground petroleum (where present) in these wells, sampling of surface waters and soils, and laboratory and field pilot tests of remedial options.

B. The Phase II Investigation Work Plan submittal shall include, but not be limited to, the following items: (1) a quality assurance project plan; (2) a sampling and analysis plan; (3) a health and safety plan; (4) a community relations plan; (5) a data management plan; and (6) a schedule for implementation of all tasks set forth in the Work Plan. It is understood that some or all of these activities may already be underway.

C. The Phase II Investigation Work Plan shall include schedules for the activities, a description of work already underway and its preliminary results, and a projected date for submission of final reports to IDEM giving the results of the Phase II Investigation and the interpretation of these results.

D. Within forty-five (45) calendar days of IDEM written approval of the Phase II Investigation Work Plan, Respondent shall begin to implement the plan. On-site sampling activities shall be coordinated with IDEM.

21. Additional Remedial Investigation

Depending on the results of the Phase II Investigation, further investigation may be warranted to define the nature and extent of petroleum releases. If Respondent or IDEM determines that additional investigation is necessary before undertaking a remedial action study, such party shall so notify the other in writing. Within ninety (90) calendar days of such a determination, Respondent shall submit a workplan for the additional remedial investigation. IDEM shall review and approve, disapprove, or modify and approve the workplan. The Respondent maintains its right to Dispute Resolution as indicated in Section F., Paragraph 13 of the Agreed Order to which this Agreement is attached, for additional work requested by IDEM.

XI. HUMAN HEALTH AND ENVIRONMENTAL ASSESSMENT

22. Within sixty (60) calendar days following completion of all the investigations described above, and written approval of the final report of the final phase of the investigation for offsite areas, Respondent shall submit to IDEM a work plan entitled "HUMAN HEALTH AND ENVIRONMENTAL ASSESSMENT WORK PLAN" (HHEA) which will describe Respondent's proposed human health and environmental assessment for the offsite area. This work plan shall include an overview of existing information, the data basis of the assessment, the technical approach, an itemization of deliverable items, and a schedule for submissions and completion. IDEM shall review the HHEA Workplan and disapprove, approve, or modify to approve pursuant to Section F.4. of the Agreed Order to which this Agreement is an Exhibit.

XII. REMEDIAL ACTION STUDY

23. Within sixty (60) calendar days following approval of the Human Health and Environmental Assessment of the offsite areas, the Respondent shall submit to IDEM a work plan for a remedial action study, which will describe Respondent's proposed study of the feasibility of remedial options. The feasible remedial options for the areas shall be based on the results of the Human Health and Environmental Assessment for the Offsite Areas. The remedial action study work plan shall include a schedule for evaluating the feasibility, effectiveness, cost, and implementation timetable of potential remedial actions for the Petroleum Facility and Offsite Areas and a projected date for submission of a report (remedial action study report) providing the results of the evaluation and proposing specific remediation methods.

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Server response: 200 (HTTP_OK)
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Please make sure this file can be accessed by typing it into your browsers address bar then pressing enter.

If the file exists then the browser will prompt you to download it.Cancel the prompt and report this problem to your Website Administrator.

If the file does not exist then the browser will provide you with an error message that may help further.

XV. COMPLIANCE WITH APPLICABLE LAWS

29. In the event of conflicting regulations or statutes, all affected schedules and time frames in this Agreement and associated work plans shall be suspended until resolution of the conflict to the satisfaction of IDEM, Respondent, and other involved parties. Work not subject to the conflict shall continue in accordance with this Agreement. Respondent shall be responsible for obtaining all federal, state, or local permits which are necessary for the performance of any work hereunder.

30. The IDEM Project Coordinator shall have the authority to halt any work proceeding under this Agreement and/or any response actions or portions thereof when conditions present an imminent and substantial endangerment to public health or welfare or the environment. The IDEM representative shall coordinate necessary response action with appropriate Amoco personnel. In the event that the IDEM representative halts work pursuant to this paragraph, the schedule of work described in the work plan and this Agreement shall be modified accordingly.

XVI. QUALITY ASSURANCE

31. The Respondent shall use quality assurance, quality control, and chain of custody procedures for U.S. EPA SW-846 sampling methods in accordance with the Indiana Quality Assurance Project Plan, which has been approved by the U.S. EPA, throughout the remedial investigation/remedial action study sample collection and analysis activities under this Agreement, unless IDEM agrees otherwise.

XVII. SAMPLING AND DATA/DOCUMENT AVAILABILITY

32. The Respondent shall make the results of all sampling, including raw data, and/or tests or other data generated by the Respondent, or on the Respondent's behalf, with respect to this Agreement, available to IDEM. IDEM will make available to the Respondent the results of sampling, including raw data, and/or tests or other data similarly generated by IDEM.

33. At the request of IDEM, the Respondent shall provide IDEM and/or its representative an opportunity to split or duplicate samples collected by the Respondent pursuant to the implementation of this Agreement. At the request of the Respondent, IDEM or its authorized representative, shall provide Respondent the opportunity to split or duplicate samples collected by IDEM and/or its authorized representative pursuant to the implementation of this Agreement. Each party shall notify the other at least seven (7) days in advance of any sample collection activity.

34. Respondent may assert a business confidentiality claim covering all or part of any information submitted to the Department pursuant to this Agreement. Information determined to be confidential by the Department shall be disclosed only to the extent permitted by IC 13-7-6-6. If no such confidentiality claim accompanies the information when it is submitted to the Department, it may be made available to the public by the Department without further notice to the Respondent. Respondent agrees not to assert any confidentiality claim with regard to any physical or analytical data collected in the execution of workplans conducted under this Agreement.

XVIII. PLANS AND REPORTS

35. All workplans required by the terms of this Agreement are made part of and incorporated into the Agreed Order of which this Exhibit is a part. Any noncompliance with conditions contained in such approved workplans shall be termed noncompliance with the Agreed Order.

XIX. COMMUNITY RELATIONS

36. The Respondent and IDEM will cooperatively or independently provide information about this Agreement and the workplans, investigations, and results to the public. IDEM or Respondent will give the other party a minimum of 2 weeks notice, if possible, of any public meetings it may hold for the sole purpose of discussing this Agreement, and the workplans, investigations, and results associated with the Agreement. Public meetings will be open to the general public. Either party may request the other party to attend and/or participate in such meetings.

37. A site information file shall be maintained by IDEM at the Department's Northwest Office in Gary. Respondent shall be notified of the location of said repository. Respondent will also maintain an independent site information file that will be maintained by the Respondent and will notify IDEM of the location of said repository.

XX. DISPUTE RESOLUTION

38. The Respondent maintains its right to Dispute Resolution as set forth in Paragraph 13 of the Agreed Order to which this Agreement is attached, for any modification or disapproval by IDEM or other dispute under this Exhibit D.

XXI. FORCE MAJEURE

39. The Respondent maintains its right to Force Majeure as set forth in Paragraph 15 of the Agreed Order to which this Agreement is attached.

XXII. RESERVATION OF RIGHTS

40. IDEM and Amoco reserve all rights and defenses they may have pursuant to any available legal authority.

41. Nothing included herein is intended to release, discharge, or in any way affect any claims, causes of action or demands in law or equity which the parties may have against any person, firm, partnership, municipality, corporation or other legal entity, not a party to this Agreement, for any liability such non party may have arising out of, or relating in any way to, the generation, storage, treatment, handling, transportation, release or disposal of any materials, hazardous substances, hazardous wastes, constituents of a hazardous waste, municipal waste, industrial wastes, special wastes, contaminants or pollutants at, to or from the Site. The parties to this Agreement expressly reserve all rights, claims, demands, and causes of action they have against any and all other persons and entities who are not parties to this Agreement, and as to each other for matters not covered hereby.

42. IDEM recognizes that Amoco may have the right to seek contribution, indemnity, or other available remedy against any person found to be responsible or liable for amounts which have been or will be expended by Amoco in connection with the Petroleum Facility.

43. Nothing in this Agreement is intended by the parties to be an admission of fact or law by Amoco.

XXIII. STIPULATED PENALTIES

44. Respondent shall be liable for payment to IDEM of the sums described and set forth in Paragraphs 13 of the Agreed Order to which this Agreement is attached.

XXIV. EFFECTIVE DATE AND SUBSEQUENT MODIFICATION

45. The effective date of this Agreement shall be the date on which notice of approval of this Agreement is received by the Respondent.

46. This Agreement may be amended by mutual agreement of IDEM and the Respondent. Minor amendments shall be in writing and shall be effective when signed by the Assistant Commissioner of the Office of Solid and Hazardous Waste Management. Major amendments shall be in writing and shall be effective when signed by the Commissioner of IDEM. This Agreement and all workplans, reports, and amendments shall become part of and incorporated into the Agreed Order of which this Agreement is an Exhibit.

XXV. EXTENSIONS OF TIME PERIODS

47. Any written response shall be deemed timely performed as set forth in paragraph F.4.g. of the Agreed Order to which this Agreement is attached.

48. Whenever any party is called upon to respond or otherwise act in a certain number of days, and if the final day occurs on a Saturday, Sunday, or legal holiday (whether state or national), such time limitation shall automatically extend to the next business day after such Saturday, Sunday, or holiday.

49. Any time periods specified in this Agreement may be extended as noted in Paragraphs F.12 a. and/or F.15.a. through c. of the Agreed Order of which this Agreement is a part.

XXVI. TERMINATION AND SATISFACTION

50. As Respondent completes various phases of the work under this Agreement, Respondent shall issue written notice thereof to IDEM. If said work has been completed to the reasonable satisfaction of IDEM, IDEM shall issue to Respondent a written notice of satisfactory completion of said work. Upon IDEM's issuance of such a notice, Respondent's obligations under this Agreement shall be deemed satisfied and terminated to the extent of such completion. This notice shall not include any other work which may be required under this Agreement or under the terms of the Agreed Order of which this Agreement is a part. IDEM's notice of satisfactory completion shall not be unreasonably withheld.

51. Nothing in this Agreement shall restrict the State of Indiana from seeking other appropriate relief to protect human health or the environment from pollution or contamination at or from this Petroleum Facility not addressed in this Agreement.

XXVII. PRECEDENCE OF AGREED ORDER

52. In the event that a conflict arises among the terms and conditions of this Exhibit D and those required by the Agreed Order, the Agreed Order shall govern and the terms and conditions thereunder shall determine the parties' rights and responsibilities.

TECHNICAL RECOMMENDATION

BY: _____
Michael E. Sickels, Chief
Corrective Action Section
Indiana Department of
Environmental Management

Date: 9/13/95

ATTORNEY FOR RESPONDENT

BY: Ronald J. Hanis

TITLE: Attorney

Date: 10/27/95

OFFICE OF LEGAL COUNSEL

BY: _____
Office of Legal Counsel
Indiana Department of
Environmental Management

DATE: 9/18/95

AMOCO OIL COMPANY

BY: _____
Daniel H. Wilson

TITLE: Manager of Whiting
Business Unit

DATE: 11/9/95

ATTACHMENT TO EXHIBIT D

AGREEMENT PURSUANT TO INDIANA PETROLEUM RELEASE LAW

Areas Of Concern and Corrective Actions that relate to releases to be treated under Exhibit D (Agreement Pursuant to Indiana Petroleum Release Law IC, 13-7-20.1, for a Facility Investigation for a Petroleum Release):

	AOC	CORRECTIVE ACTION
(1)	Refinery Process Sewer System, consisting of steel, cast-iron, and concrete piping located beneath the entire Facility (including the J&L Site, the Buffalo Side, the tank fields, and the Dock Area), which carries process wastes, contaminated rinse waters, contaminated storm water, contaminated ground water pumped by the wellpoint systems, liquids from dewatering of special wastes, and other materials to the Lakefront Wastewater Treatment facility. This system includes all sumps (gravity and lift station types), including sumps located at the Docks Area and the Buffalo Side, leading to the Refinery process sewer system.	PREVENTATIVE MEASURE: Develop a plan to determine the occurrence, extent, and locality of on-going releases of oils and oily wastes from the process sewer system. This plan should evaluate potential methods of conducting an integrity test of the system. This plan should include the sumps and sewers located at the Refinery Area, the J&L Site, the Buffalo Side, the tank fields, and the Dock Area.
(2)	Pipe Alleys, which consist of excavations located along roads and between units throughout the Refinery.	PREVENTATIVE MEASURES: Develop a plan of action for the investigation and remediation of new or on-going releases from the pipe alleys including the maintenance of proper clearance and drainage for corrosion protection of the pipes. Develop a plan to evaluate below grade lines that will include either a

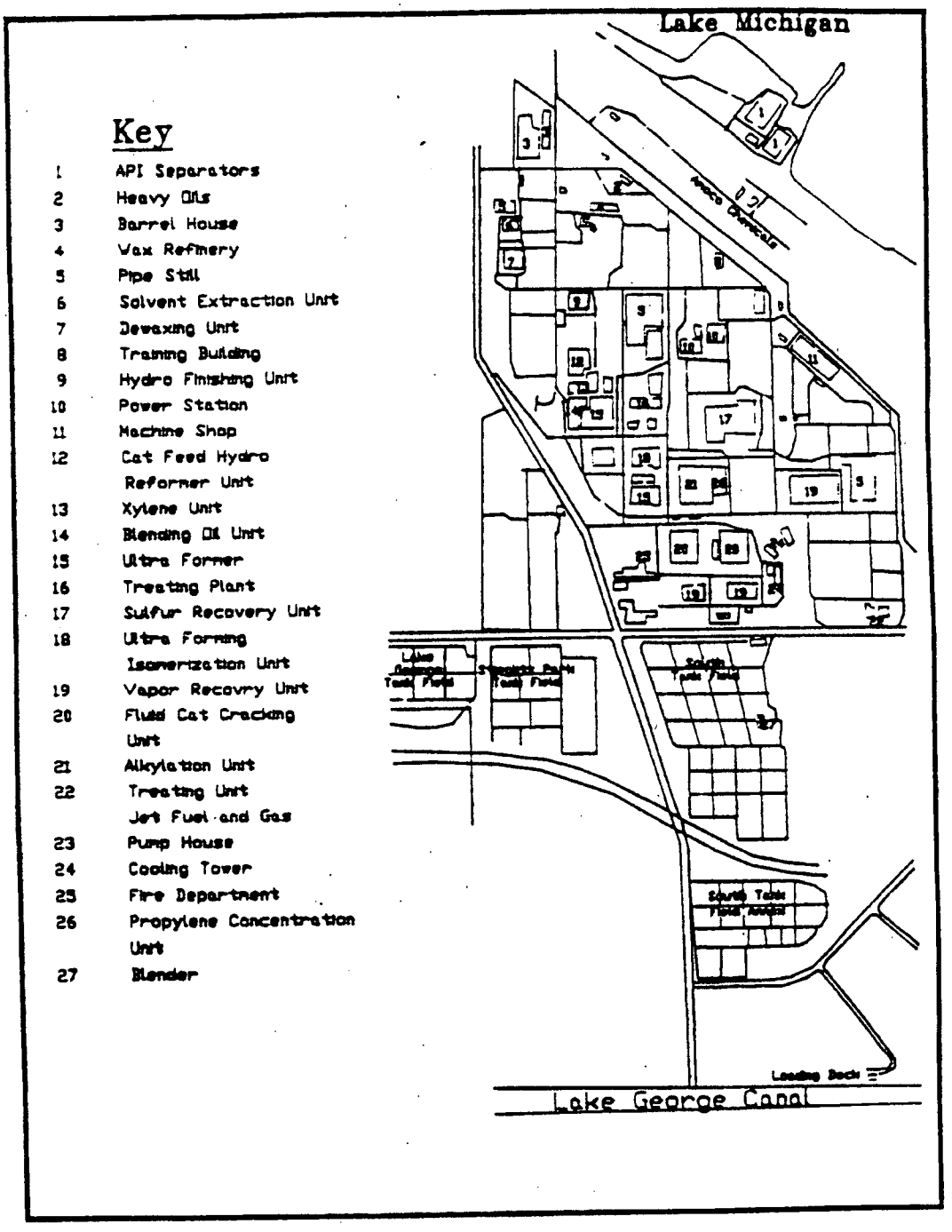
		program for integrity testing of those lines that remain below grade or raising lines to be above grade. Evaluate potential containment structures that might be built to prevent future piping leaks from having direct contact with surficial soils.
(3)	Diked areas throughout tank fields.	PREVENTATIVE MEASURES: Develop a plan of action for the investigation and remediation of new or on-going releases from the diked areas in the tank fields.
(4)	Sites of former underground storage tanks, which have been removed. a. 8,000 gallon fiberglass tank that held gasoline in the Refinery garage area. Tank was removed in 1989. b. 2,000 gallon fiberglass tank that held diesel and gasoline in the Refinery garage area. Tank was removed in 1990. c. 2,000 gallon steel tank that held waste petroleum products at the Technical Services Building. Tank was removed in 1989. d. 1,000 gallon steel tank that held no. 6 fuel in the southeast portion of the Refinery. Tank was removed in 1989.	Incorporate into the Petroleum Investigation (Exhibit D) a plan to specifically investigate potential releases from these removed underground tanks. This plan should evaluate whether releases of petroleum and/or petroleum related products are concentrated near former tank sites. Respondent may submit existing sampling data to demonstrate that there was no release from underground tanks at these sites. If information indicates that a plume of free-phase petroleum overlaps any or all of these areas, these areas will be incorporated into the general Petroleum Investigation.

	e. 1,500 gallon steel tank that held petroleum products in the south tank field. Tank was removed in 1990.	
(5)	Refinery Roads/Streets System, located throughout the Facility which have received routine and systematic releases from trucks, process units, equipment, and loading and unloading areas.	No further action at this time.
(6)	Truck Garage Used Oil Satellite Accumulation System and Area.	No further action at this time.
(7)	Technical Services Building (TSB) Basement Ejection Sump Area, in the northwest corner of the TSB basement.	No further action at this time.

CAUSE NO. H-11187
Total Pages: 2

EXHIBIT E
MAP OF AMOCO WHITING REFINERY AND RELATED AMOCO SITES

Amoco Oil Company, Whiting Refinery
2815 Indianapolis Blvd.
Whiting, Indiana



REFINERY SITE MAP
Amoco Oil Company
Whiting, Indiana

CAUSE NO. H-11187
Total Pages: 6

EXHIBIT F
SOLID WASTE MANAGEMENT UNITS AND AREAS OF CONCERN AND REQUIRED CORRECTIVE ACTION ELEMENTS

Amoco Oil Company, Whiting Refinery
2815 Indianapolis Blvd.
Whiting, Indiana

A. REFINERY AREA

Solid Waste Management Units that require further action under this Agreed Order:

	SWMU	CORRECTIVE ACTION
(1)	Cat Pad. Located near the northern perimeter of the Refinery, this unit is used for the storage of heat exchanger cleaning solids (K050), activated alumina, feed filters, sand blast grit, and spent carbon in drums.	RFI for soils surrounding the pad. PREVENTATIVE MEASURE: Check integrity of the concrete pad and seal all cracks. Perform semi annual inspections for additional cracks in concrete.
(2)	Tail Gas Unit Sulfur Pile Area.	PREVENTATIVE MEASURE: Provide containment for this open sulfur pile to ensure that surficial runoff will not carry material elsewhere.
(3)	Special Waste Rolloffs. Located at various locations throughout the refinery. Used for the collection of oil-contaminated rags and debris, solid petroleum sample residuals, small amounts of spent catalyst, and other debris fitting the special waste category.	PREVENTATIVE MEASURE: Provide a plan that ensures that any contents do not get released to the environment from these units. This plan should include liners for those rolloffs that hold oily debris and the placing of such rolloffs that are in permanent locations on containment. Specific rolloffs to be addressed include:

		a. Rolloff used for used laboratory sample bottles. b. Rolloff used for oily wastes at the Transfer Pad. c. Rolloff used for crushed drums at the recycle yard.
(4)	Asphalt Material Reclamation Project Area.	RFI for soils in the Asphalt plant focusing on areas around the waste asphalt storage unit and the containment around the various tanks in the asphalt plant. PREVENTATIVE MEASURE: Provide more complete containment at the waste asphalt storage area.
(5)	Waste wax storage area	PREVENTATIVE MEASURE: Provide complete containment for the storage site or remove this storage site and store the waste wax at another site that has more complete containment.

Solid Waste Management Units at the Refinery that require No Further Action at the time of this Agreed Order:

	SWMU	CORRECTIVE ACTION
(1)	Electrostatic Precipitators and Hoppers at the Fluid Catalytic Cracking Units.	No further action at this time.
(2)	Spent Catalyst Storage Bin, located northeast of the FCUs, consisting of a 900-ton capacity silo in which spent FCU catalyst is stored.	No further action at this time.

(3)	Acetone Satellite Accumulation Area, located at the FCU control room.	No further action at this time.
(4)	Nickel-Cadmium and Lead-Acid Battery Satellite Accumulation Point, located in the main mechanical shop.	No further action at this time.
(5)	1,1,1-Trichloroethane Satellite Accumulation Point, located in the main mechanical shop.	No further action at this time.
(6)	Rolloff Boxes at 4C Treating Plant, consisting of seven (7) dedicated 20-cubic yard rolloff boxes used to store spent bender catalyst and/or spent treating clay.	No further action at this time.
(7)	Laboratory Hazardous Waste Storage Area.	No further action at this time.
(8)	Laboratory Trichloroethene Satellite Accumulation Area.	No further action at this time.
(9)	Former 7 and 8 Tank Area at Number 12 Pipe Still.	No further action at this time.
(10)	Transfer Pad.	No further action at this time.
(11)	Used Oil Tank, consisting of a 31,500-gallon capacity, above-ground tank in which used oil from service stations is stored. The used oil is burned for energy recovery at the power stations. This SWMU is located south of the power stations near the Crude and Asphalt building.	No further action at this time.
(12)	Asbestos Storage Pad.	No further action at this time.

(13)	Laboratory Sample Emptying Area, located on Laboratory/TSB first floor loading dock.	No further action at this time.
(14)	Technical Services Building Basement Bottle Washing Area.	No further action at this time.
(15)	Lime Blowdown Thickening Tank at Power Stations.	No further action at this time.
(16)	Refinery Recycle Yard.	No further action at this time.
(17)	Former On-ground Bender Catalyst Storage Area, consisting of an 11,000-square foot area between 129th Street and Berry Lake Road.	No further action at this time.

Areas of Concern at the Refinery that require **No Further Action** at the time of this Agreed Order:

	AOC	CORRECTIVE ACTION
(1)	Former Caustic Bath Parts Cleaner located in the main mechanical shop.	No further action at this time.
(2)	Former Kerosene Parts Cleaner located in the relief valve section of the main mechanical shop.	No further action at this time.
(3)	Current and former tanks that were used to manage spent caustic, which is now used in the Facility's waste-water treatment plant:	No further action at this time.
	(a) D-100 Tank at the Propylene Concentration Unit, consisting of a 3200 gallon above-ground unit.	

(b) D-216 Tank at the Butamer and Catalytic Refining Unit, consisting of a 3,200-gallon capacity, above-ground, carbon steel tank.

(c) F-12 Tank at the 4B Treating Plant, consisting of a 6,700-gallon capacity carbon steel above ground tank.

(d) Number 3 Barrelhouse Caustic Tanks, consisting of four in-ground steel tanks; two (2) tanks (NE and SE) had capacities of 1,900 gallons each, and two (2) tanks (NW and SW) had capacities of 1,600 gallons each.

(e) 396 Tank at Vapor Recovery Unit 300, consisting of a 15,900-gallon capacity carbon steel above ground tank.

(f) 860 Tank at 2 Treating Plant, consisting of a 158,800-gallon capacity, above-ground, carbon steel tank.

(g) F-14 Tank at 4C Treating Plant, consisting of a 47,000-gallon capacity, above-ground, carbon steel tank.

(h) 203 Tank at the Hydrofinishing Unit, consisting of a 4,500-gallon capacity, above-ground, carbon steel tank.

B. BUFFALO SIDE

Area Of Concern that requires No Further Action at the time of this Agreed Order:

	AOC	CORRECTIVE ACTION
(1)	Treatment, Storage and Storm Water Surge Tanks.	No further action at this time.

C. DOCK AREA

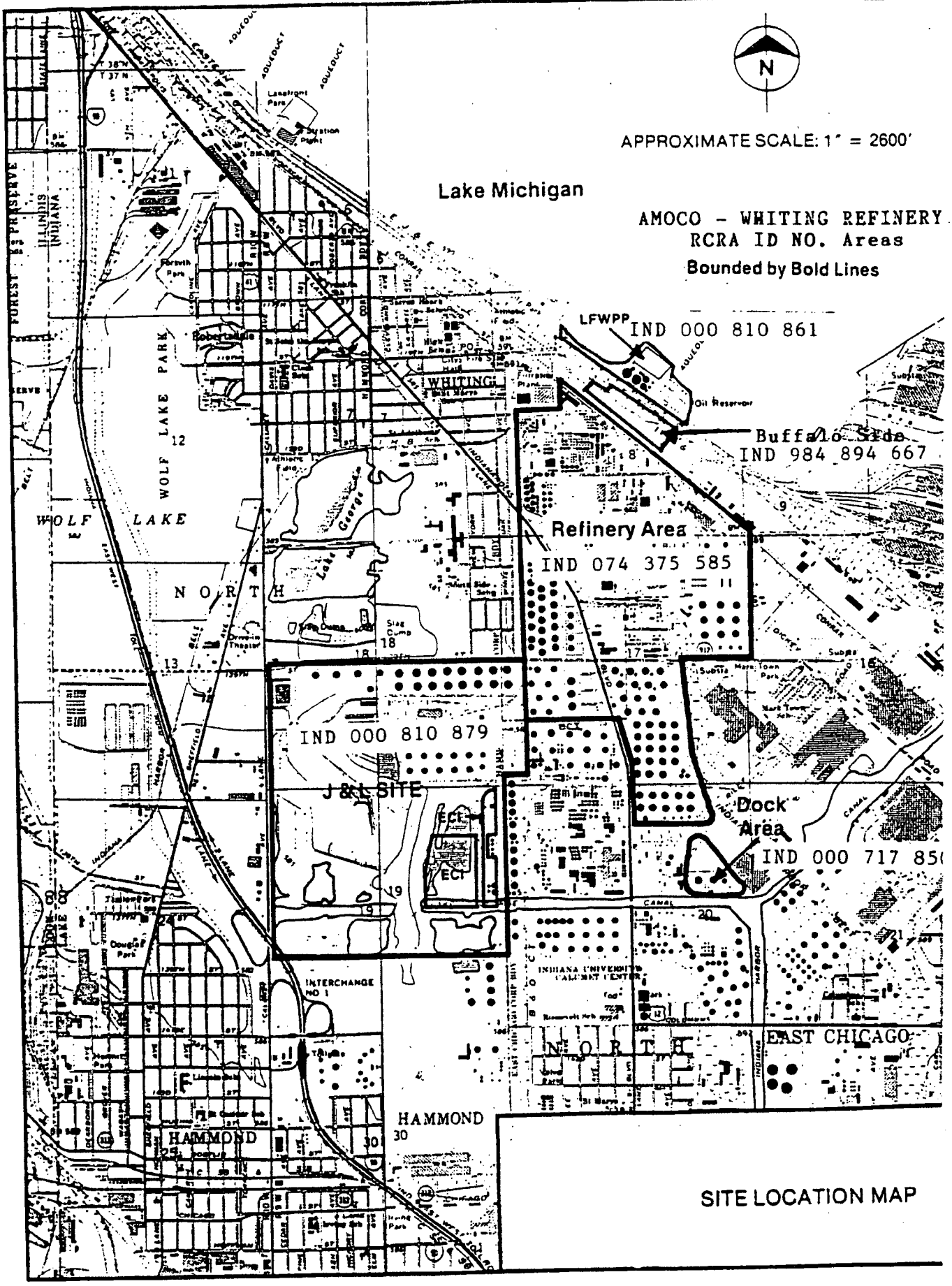
Area of concern that requires Corrective Action under this Agreed Order:

	AOC	CORRECTIVE ACTION
(1)	Barge ballast cleaning system and connected oil recovery system, which leads to diked holding tanks and from there to the Refinery process sewer system.	This system will be examined as part of the Petroleum Release Investigation (Exhibit D), and will be treated as part of the overall process sewer system.

CAUSE NO. H-11187
Total Pages: 2

EXHIBIT G
LOCALITY MAP FOR AMOCO WHITING REFINERY

Amoco Oil Company, Whiting Refinery
2815 Indianapolis Blvd.
Whiting, Indiana


N
APPROXIMATE SCALE: 1" = 2600'
Lake Michigan
AMOCO - WHITING REFINERY
RCRA ID NO. Areas
Bounded by Bold Lines
LFWPP
IND 000 810 861
Buffalo Side
IND 984 894 667
Refinery Area
IND 074 375 585
IND 000 810 879
J&L SITE
Dock Area
IND 000 717 85(
WOLF LAKE
WOLF LAKE PARK
NORTH
WHITING
HAMMOND
EAST CHICAGO
INTERCHANGE NO 1
SITE LOCATION MAP

CAUSE NO. H-11187
Total Pages: 16

EXHIBIT H
AGREEMENT FOR A FACILITY INVESTIGATION AT THE J&L SITE

Amoco Oil Company, Whiting Refinery
2815 Indianapolis Blvd.
Whiting, Indiana

The parties to this cause now wish to settle and compromise this action without hearing or adjudication of any issue of fact or law, and the Indiana Department of Environmental Management finds and Respondent neither admits nor denies the following Findings of Fact:

I. FINDINGS OF FACT

A. This Agreement is entered into voluntarily by the Indiana Department of Environmental Management (IDEM) and Amoco Oil Company (Respondent). It is the intention of the parties that this Agreement, and the Agreed Order to which this Agreement is an Exhibit, shall constitute the exclusive administrative remedy for any non-petroleum contamination at the J&L Site ("Site") described in Attachment A of this Order.

B. It is the understanding of the parties that this Order is entered into to review the assessments of existing contamination, determine appropriate measures in response to existing contamination, manage the environmental impacts of existing contamination, and take appropriate and cost-effective measures for the J&L Site located in Hammond, Indiana.

C. This Agreement is issued under the authority vested in the Commissioner of IDEM pursuant to the Indiana Environmental Management Act, IC 13-7 et seq.

D. The Respondent agrees to undertake all actions required by the terms and conditions hereunder, and consents to and will not contest or legally challenge the issuance of this Agreement or IDEM's jurisdiction regarding this Agreement, except to the extent outlined in Paragraph 13. of the Agreed Order to which this Agreement is attached (DISPUTE RESOLUTION).

E. This Agreement shall apply to and be binding upon IDEM and the Respondent, its officers, directors, employees, agents, successors, and assigns. The signatories of this Agreement certify that they are fully authorized to execute and legally bind the parties they represent to this Agreement.

F. The Respondent shall provide a copy of this Agreement, if in force, to any subsequent owners or successors before ownership rights are transferred. Respondent shall by contract require that all contractors, firms, and other persons acting for it comply with the terms of this Agreement to the extent applicable to them.

G. In entering into this Agreement, the mutual objectives of IDEM and Respondent are:

1. to work cooperatively to identify appropriate measures that should be taken at the J&L Site to ensure the protection of human health and the environment;

2. to effectively manage the environmental impact of the J&L Site;

3. to review and assess the existing Phase I and Phase II environmental assessments of the J&L Site and identify "data gaps", if any;

4. to expedite containment management initiatives to protect human health and the environment;

5. to commit to conduct further environmental assessments as deemed necessary by the parties;

6. to conduct a human health and environmental risk assessment for the J&L Site to guide remedial measures;

7. to perform a surface water and stormwater study to assess relationships between stormwater runoff and surface water impacts; and

8. to enhance the aesthetic qualities at the J&L Site.

H. The activities conducted by the Respondent under this Agreement: shall provide all appropriate and necessary information for the studies agreed to herein; shall be consistent with the requirements of the Agreed Order to which this Agreement is an exhibit, and the Indiana Environmental Management Act, IC 13-7 et seq., and shall employ sound scientific, engineering, and management practices.

I. Amoco Oil Company purchased the site known as the J&L Site ("Site") in 1948 from Jones & Laughlin Steel Company, now known as LTV Steel, which had placed a slag ridge on the Site before 1948. Amoco purchased the Site for additional storage tanks and a disposal area for wastes. Amoco Oil Company ceased disposal at the Site in the middle 1970's. Respondent contends that no

Resource Conservation and Recovery Act (RCRA)-related activity took place on the Site. Lime sludge, spent FCU catalyst and construction materials were stored at the Site past the middle 1970's.

J. The Site is located southwest of the refinery property and is separated from the refinery by public rights-of-way and by property under the exclusive control of corporate entities other than Amoco Oil Company.

K. Amoco records indicate that several distinct areas in the Site were used for storage of construction materials, and disposal of municipal wastes and refinery wastes. Besides the Amoco refinery, several entities were responsible for generating various wastes, including the City of Hammond, the City of Whiting, Bairstow, Lindahl Trucking, R. C. Can Company, and Vic Kirsch Construction. Haulers of these wastes included Amoco Oil Company, Bairstow, Calumet Waste Systems, the City of Hammond, the City of Whiting, Howard Morris, Justak Brothers, Justak & Sons, Lindahl Trucking, Morrison Construction, National Power Rodding, Superior Construction, and Vic Kirsch Construction.

L. The Site contained the following pits corresponding to the map attached as Attachment A:

1. Asphalt, heavy sludges, and rubbish dump (cleaned 1974 - 1977)
2. Landfill area and acid sludge (cleaned by 1977)
3. Caustic pit (cleaned 1974 - 1977)
4. XGA soap pit (closed 1955, cleaned 1974 - 1977)
5. Buffer pit (cleaned 1974 - 1977)
6. Buffer pit (cleaned 1974 - 1977)
7. Caustic pit and acid sludge (cleaned 1974 - 1977)
8. XGA soap pit (cleaned 1974 - 1977)
9. Buffer pit (cleaned 1974 - 1977)
10. R&D laboratory wastes, tar & asphalt (small quantity)
11. Heavy sludges (tar & asphalt)
12. Barrel pit, R&D waste
13. (3 units) Aluminum chloride pits (used until approx. 1959)

13a. Radiological wastes (removed in 1966 - no detectible levels at present)

14. Garbage and municipal trash from Hammond and Whiting, IN; spent filters, clays
15. Garbage and municipal trash from Hammond and Whiting, IN; asphalt, slag
16. Storage area for spent FCU catalyst fines (tested and found RCRA non-hazardous), sludges, clays
17. Chemical disposal of TEL or TMEL (leaded tank bottoms - tests showed no lead)
18. Storage area for lime sludge and boiler house sludge

19. (2 units) General dumping area used for trash, excavated materials, spent treating and filter clays, and material from cleanup of spills in the refinery
20. Iron sulfide
21. AFU (Air floatation unit)(DAF) sludges
22. Storage area for inert fill such as dirt and construction debris, boiler house water treating sludge (precipitated calcium and magnesium compounds from treatment of boiler feed water)
23. AFU skimmings
24. AFU skimmings
25. Biological sludges
26. Coke pit
27. Caustic

M. Wastes were deposited in the previously listed areas between 1948 and approximately 1974.

N. Amoco ceased disposing of wastes at the Site in 1974. Amoco currently uses the Site for several product storage tanks and a warehouse. Amoco currently leases a portion of the Site to Amoco Pipeline Company for a pipeline transfer facility.

O. Respondent contends that many pits were emptied in 1974 through 1977 and the pits filled with soils. For example, from 1974 to 1977 the liquids from the buffer, caustic, and soap pits were pumped back to the refinery at a controlled rate for treatment and disposal at the refinery's "Lakefront Wastewater Treatment Facility". Semi-solids and hydrocarbons from the soap pits were removed and burned as fuel at the refinery. This general cleanup of the Site was accomplished by 1977.

P. Amoco Oil Company is a "person" as that term is defined in IC 13-7-1-17.

Q. Amoco Oil Company is subject to IC 13-7-4-1 at the J&L Site.

R. The Site contains "solid waste" as defined in IC 13-7-1-22.

S. The Commissioner may enter into an agreement pursuant to IC 13-7-5-2.

II. ORDER

WHEREFORE, it is hereby ORDERED that:

A. SITE ASSESSMENT

1. Amoco shall perform human health and ecological risk assessments for the site consistent with exhibits to the Agreed Order to which this Agreement is an exhibit, to the extent that the elements of said Exhibits are relevant and appropriate, to determine the potential human/environmental exposure to hazards identified at the site and whether corrective measures are necessary to mitigate further releases to the environment. Amoco shall submit the report for the human health risk assessment and a workplan for the ecological risk assessment within sixty (60) days of the effective date of the Agreed Order to which this Agreement is an exhibit. The ecological risk assessment workplan shall contain a schedule for its completion. Amoco may consider restricting future use to industrial or commercial operations through deed restrictions based on current knowledge of conditions and the most current relevant health based standards.

2. Amoco shall submit a Phase II environmental report within ninety (90) days of the effective date of the Agreed Order to which this Agreement is an exhibit. IDEM shall review Amoco's human health risk assessment report and ecological risk assessment plan and comment on its technical merits and subsequent conclusions. Within sixty (60) days of notice of approval of the ecological workplan and agreement on any further human health risk assessment to be conducted, Amoco shall begin conducting the risk assessment(s) according to the approved schedule.

3. Amoco agrees to conduct additional environmental assessments necessary and appropriate to assess the nature and extent of contamination at the Site after IDEM completes its review of the Phase I and Phase II environmental assessments submitted by Amoco to IDEM. Within ninety (90) calendar days of the determination that additional assessment is needed, Respondent shall submit a workplan for the additional assessment. IDEM shall review and approve, disapprove, or modify and approve the workplan. The Respondent maintains its right to Dispute Resolution as indicated in Section F., Paragraph 13 of the Agreed Order to which this Agreement is attached, for additional work requested by IDEM.

4. Assessment work performed subsequent to the initial monitoring may be performed on a more limited set of constituents in consideration of the results obtained during the Phase I and Phase II assessments and mutually agreed to by IDEM and the Respondent.

B. CORRECTIVE MEASURES

1. Based upon the conclusions of the site risk assessment, Phase I and Phase II environmental assessments, and any subsequent assessments performed, and upon notice of the IDEM that a corrective measures evaluation is required, within ninety (90) days, Respondent shall submit a corrective measures evaluation workplan consistent with exhibits to the Agreed Order to which this Agreement is an exhibit to the extent that the elements of said Exhibits are relevant and appropriate. The evaluation of appropriate remedial measures that protect human health and the environment shall be based on sound scientific, engineering and construction practices. The development and evaluation of remedial measures shall take into consideration human health and environmental risk, current and future land use, and remedial activities performed voluntarily or under other agreements with IDEM that could potentially affect the efficiency, effectiveness, or scope of any remedial measures conducted pursuant to this Agreement.

C. INTERIM MEASURES

1. Interim Measures may be implemented prior to completion of assessment work or final site remedial measures. The goal of Interim Measures is to prevent and abate off site migration of contaminants that present a threat to human health and the environment. Interim Measures shall be consistent with the goals of remedial measures performed under other agreements between Amoco and IDEM, and such other remedial measures shall remain under the authority of those agreements. Amoco has developed and implemented several pollution control measures to prevent migration of contamination from the Site. These measures included the following:

   a. upgrade of the oil/water separator near outfall # 003;
   b. installation of sheet piling south of the Lake George Canal;
   c. installation of a sheet piling weir system in the western drainage ditch which catches oils and debris from stormwater runoff from the Site;
   d. collection of water at Outfall #004 for treatment at the Wastewater Treatment Plant;
   e. installation of groundwater well point systems (J-141 A&B) on the southern boundary to control hydrological flow;
   f. installation of oil recovery and well point systems along 129th Street in the Lake George Tank Field (9 wells);
   g. installation of hydrocarbon recovery wells at the Calumet Avenue Warehouse Site (3 wells); and
   h. conduct seismic and electromagnetic surveys to define the subsurface.

2. Within one-hundred-eighty (180) days of the effective date of the Agreed Order to which this Agreement is an exhibit, Respondent shall submit a workplan for the following interim measures. This workplan will include a timetable for the completion of these tasks.

   a. Install sheet piling and a french drain system at the northeast corner of the intersection of Cline Avenue and Calumet Avenue.

   b. Install a winterized recovery sump in the hydrocarbon recovery system operating south of Lake George Canal.

   c. Install additional wells and skimming devices to enhance the hydrocarbon recovery system operating at J&L Tank Field.

   d. Develop and conduct a Surface/Stormwater Runoff Study ("Study") for the Site to determine the relationships between stormwater runoff and surface water quality at the Site, as well as any off-site impacts from such relationships. The results of this Study shall be conveyed to IDEM for review and comment on its technical merits and subsequent conclusions.

   e. Control soil erosion of the site referred to as the "J&L Highlands" through on-going revegetation of the site.

   f. Develop and implement aesthetic enhancement projects to improve the visual quality of the Site observed from Calumet Avenue.

   g. Complete a pilot scale treatability study in the corrective measures evaluation, for ground water inclusive of leachate and hydrocarbon recovery.

   h. Complete groundwater flow-recharge-discharge modelling to predict groundwater movement and re-evaluate as necessary to reflect changes in current work.

D. REPORTING

1. Reporting shall be consistent with the Agreed Order to which this Agreement is an exhibit and coordinated for submittal together with reporting as may be required under refinery corrective action when practical.

pursuant to the terms and conditions of this Agreement shall be directed through the Project Coordinators. During implementation of this Agreement, the Project Coordinators shall, whenever possible, operate by consensus and shall attempt in good faith to resolve disputes informally through discussion of the issues.

2. The IDEM Project Coordinator shall have the authority of a Remedial Project Manager as described by the National Contingency Plan (NCP), including the authority to halt, conduct, or direct any work required by this Agreement and/or any response actions or portions thereof upon a finding that conditions present an imminent and substantial endangerment to public health or welfare or the environment. In the event that the IDEM Project Coordinator halts work pursuant to this paragraph, the schedule or work described in the Work Plans and this Agreement shall be modified accordingly and shall be subject to the approval of IDEM.

3. The absence of the Respondent's or IDEM's Project Coordinator from the facility shall not be cause for the stoppage of work. The Respondent's Project Coordinator or his designee shall be available by telephone while any field investigation is being performed.

H. QUALITY ASSURANCE/QUALITY CONTROL

1. The Respondent shall use quality assurance, quality control, and chain of custody procedures consistent with SW 846, an approved Quality Assurance Project Plan (QAPP), the "EPA NEIC Policies and Procedures Manual", as revised, and "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," December 1980, QAMS-005/80, throughout all sample collection and analysis activities under this Agreement.

2. Respondent shall consult with the IDEM Project Coordinator in planning for all sampling and analysis as detailed in the Work Plan. To provide quality assurance and maintain quality control, the Respondent shall:

   a. use its best efforts to gain access for IDEM personnel and/or IDEM authorized representatives to third party laboratories and personnel utilized by the Respondent for analyses;

   b. ensure that all sampling and analyses are performed according to U.S. EPA methods, IDEM Quality Assurance Project Plan, or other methods, deemed satisfactory by IDEM.

I. SAMPLING AND DATA/DOCUMENT AVAILABILITY

1. The Respondent shall make the results of all sampling, including raw data, and/or tests or other data generated by the Respondent, or on the Respondent's behalf, with respect to this Agreement, available to IDEM, and shall submit these results at periodic meetings agreed to by IDEM and Amoco. IDEM will make available to the Respondent the quality assured results of sampling and/or tests or other data similarly generated by IDEM.

2. At the request of IDEM, the Respondent shall provide split or duplicate samples to IDEM and/or its authorized representative, of any samples collected by the Respondent pursuant to the implementation of this Agreement. At the request of the Respondent, IDEM, or its authorized representative, shall provide split or duplicate samples to the Respondent, of any samples collected by IDEM and/or its authorized representative pursuant to the implementation of this Agreement. The Respondent and IDEM shall notify either party at least seven (7) days in advance of any sample collection activity.

3. Respondent may assert a business confidentiality claim covering all or part of any information submitted to the Department pursuant to this Agreement. Information determined to be confidential by the Department shall be disclosed only to the extent permitted by IC 13-7-6-6. If no such confidentiality claim accompanies the information when it is submitted to the Department, it may be made available to the public by the Department without further notice to the Respondent. Respondent agrees not to assert any confidentiality claim with regard to any physical or analytical data collected in the execution of workplans conducted under this Agreement.

J. ACCESS

1. Department representatives, who are appropriately OSHA trained and trained by refinery personnel for the potential hazards that may be encountered in a refinery workplace, are authorized to enter the facility or other areas where work under this Order is being conducted, at reasonable times during the effective dates of this Order for the purposes of, inter alia: talking with personnel and contractors; inspecting records, operating logs, and contracts related to the facility; reviewing the progress of the Respondent in carrying out the terms of the Order; conducting such tests, sampling or monitoring as the Department or its Project Coordinator deem necessary; using a camera, sound recording, or other documentary type equipment consistent with refinery safety rules for the purpose of monitoring activities being performed

under this Order; and verifying the reports and data submitted to the Department by the Respondent. Respondent shall receive a copy of all photos, sound recordings, or other documentary information collected by the Department and may assert a confidentiality claim under IC-13-7-6-6. The Respondent shall permit such authorized persons to inspect and copy all records, files, photographs, documents, and other writings, including all sampling and monitoring data, over which the Respondent exercises control, that pertain to work undertaken pursuant to this Order. The Respondent shall comply with all approved health and safety plans. Persons with access to the immediate field work area shall comply with approved Health and Safety Plans and the requirements of 29 CFR 1910 as applicable. All persons entering the Whiting Refinery shall adhere to all refinery safety rules and procedures.

2. To the extent that work required by this Order must be done on property not owned or controlled by Respondent, Respondent shall use reasonable efforts to obtain site access agreements from the present owner(s) of such property within thirty (30) days of approval of any Workplan or required activity for which site access is required. Such agreements shall provide access for IDEM and authorized representatives of IDEM, as specified above. Reasonable efforts as used in this paragraph shall include, at a minimum, a certified letter from Respondent to the present owners of such property requesting access agreements to permit Respondent and the Department and its authorized representatives to access such property. Any such access agreement shall be incorporated by reference into this Order. In the event that agreements for access are not obtained within the effective date of this Order, Respondent shall notify the Department within seven (7) days thereafter regarding both the efforts undertaken to obtain access and its failure to obtain such agreements.

3. Nothing herein shall be construed as restricting the inspection or access authority of IDEM under any law or regulation.

K. RECORD PRESERVATION

The Respondent agrees to preserve, during the pendency of this Agreement and for a minimum of six (6) years after its termination, all records and documents (except for drafts) in the Respondent's possession or in the possession of its employees, agents, accountants, contractors, or attorneys which relate in any way of the subject matters covered by this Agreement, despite any document retention policy to the contrary. Upon request by IDEM, the Respondent shall make available to IDEM such records, or copies of any such records (except for records which are privileged as attorney/client or attorney work product).

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OK

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If the file exists then the browser will prompt you to download it.Cancel the prompt and report this problem to your Website Administrator.

If the file does not exist then the browser will provide you with an error message that may help further.

P. COMMUNITY RELATIONS

Respondent will cooperate with IDEM in providing information about the implementation of this Agreement to the public. IDEM will give the Respondent notice of and invite Respondent's attendance at any such public meetings it may hold or sponsor. Respondent shall notify IDEM of any public meetings it may hold or sponsor.

Q. EFFECTIVE DATE AND SUBSEQUENT MODIFICATION

1. The effective date of this Agreement shall be the date on which Respondent receives the Notice of Approval of the Agreed Order to which this Agreement is an Exhibit.

2. This Agreement may be amended by mutual agreement of IDEM and the Respondent. Amendments shall be in writing and shall be effective when signed by the Commissioner of IDEM.

R. TERMINATION AND SATISFACTION

1. The provisions of this Agreement shall be satisfied and terminate when IDEM gives the Respondent written notice that the Respondent has demonstrated that all of the terms of this Agreement, including additional work under Section II.F. have been completed. Such written notice shall not be unreasonably withheld.

2. Nothing in this Agreement shall restrict the State of Indiana from seeking other appropriate relief to protect human health or the environment from pollution or contamination at or from this Site not addressed in this Agreement.

S. PRECEDENCE OF AGREED ORDER

1. In the event that a conflict arises among the terms and conditions of this Agreement and those required by the Agreed Order, the Agreed Order shall govern and the terms and conditions thereunder shall determine the parties' rights and responsibilities.

IT IS SO AGREED AND ORDERED:

TECHNICAL RECOMMENDATION

BY: Michael E. Sickels

Michael E. Sickels, Chief
Corrective Action Section
Indiana Department of
Environmental Management

DATE: 9/13/95

ATTORNEY FOR RESPONDENT

BY: Ronald J. Hanna

TITLE: Attorney

DATE: 10/27/95

OFFICE OF LEGAL COUNSEL

BY: Catherine A. Gibbs

Catherine A. Gibbs
Office of Legal Counsel
Indiana Department of
Environmental Management

DATE: 9/18/95

AMOCO OIL COMPANY

BY: Daniel H. Wilson

TITLE: Manager of Whiting Business Unit

DATE: 11/9/95

ATTACHMENT A

AGREEMENT FOR A FACILITY INVESTIGATION AT THE J&L SITE

Areas Of Concern that may require Further Action to be performed in conjunction with Exhibit H (Agreement For a Facility Investigation at the J&L Site) of this Agreed Order:

AOCs

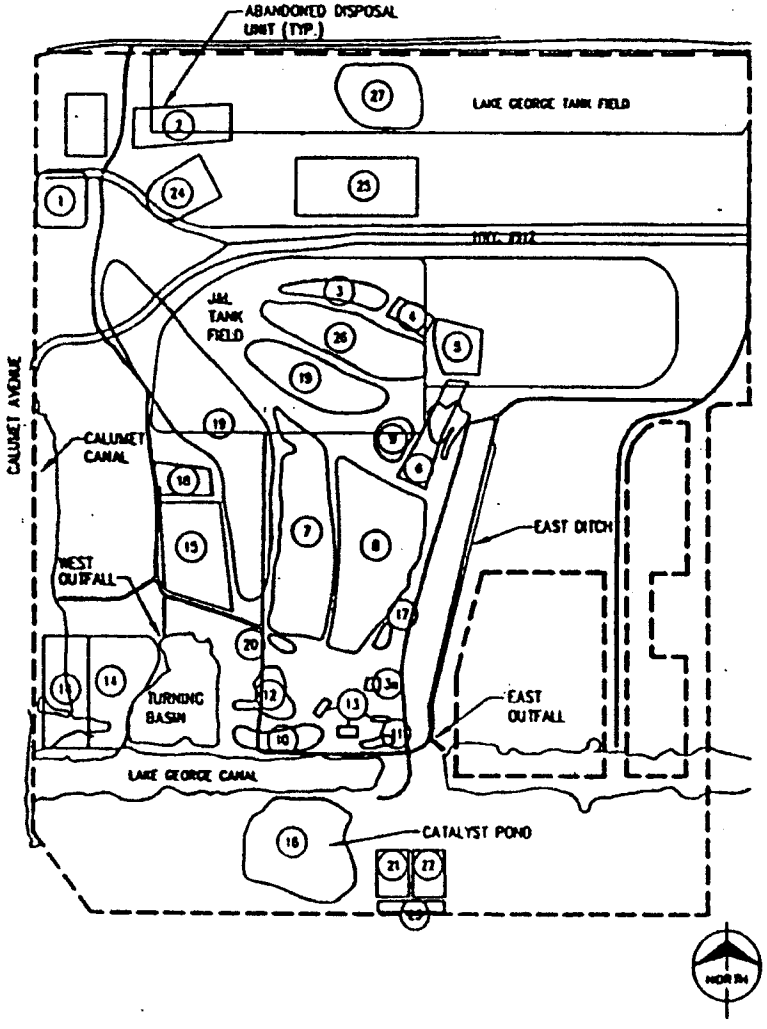
(1) Asphalt and Heavy Sludges Disposal Areas (Pits 1 and 11);
(2) Acid Sludge Disposal Area (Pit 2);
(3) Caustic Disposal Areas (Pits 3 and 27);
(4) XGA Soap Disposal Areas (Pits 4 and 8);
(5) Buffer Areas (Pits 5, 6, and 9);
(6) R&D Chemicals and Wastes Disposal Areas (Pits 10 and 12);
(7) Aluminum Chloride Disposal Area (three units, Pit 13);
(8) Radiological Waste Disposal Area (Pit 13A);
(9) Mixed Municipal Garbage and Refinery Waste Disposal Areas (Pits 14 and 15);
(10) Spent FCCU Catalyst Pond (Pit 16);
(11) Leaded Tank Bottoms Disposal Area (Pit 17);
(12) Boiler House Sludge Disposal Areas (Pits 18 and 22);
(13) Solid Waste and Spill Cleanup Disposal Area (two units, Pit 19);
(14) Iron Sulfide Disposal Area (Pit 20);
(15) Dissolved Air Flotation Unit (DAF) Skimmings Disposal Area (Pits 21, 23, 24);
(16) Biological Sludges Disposal Area (Pit 25); and
(17) Coke Pile (Area 26).

The locations of the areas of concern are indicated on the attached map. The investigation of soils and groundwater at the J&L site shall include the area in which the above AOCs are located. Determination of the exact nature of the study and the constituents to be sampled for will be the subject of a workplan to be completed before any further investigation begins.

Both of the following Areas of Concern at the J & L Site are to be treated as part of the Petroleum Release Investigation (Exhibit D).

(1) Diked areas throughout the tank fields;

(2) All Sumps to Refinery Process Sewer and Outfall 004 which is intermittently routed to the Refinery Process Sewer.



LEGEND

Pit	Waste Disposed
1	Asphalt, rubbish, heavy sludges
2	Acid sludges
3	Caustic
4	XGA soap
5	Buffer (liquid from caustic and XGA pits)
6	Buffer (secondary)
7	Caustic
8	XGA soap
9	Buffer (liquid from caustic and XGA pits)
10	R&D chemicals
11	Heavy sludges (tar & asphalt)
12	Barrels, R&D waste
13 (3 units)	Aluminum chloride
13a	Radiological waste
14	Municipal garbage, spent filters, clays
15	Municipal garbage, asphalt, slag
16	Sludges, clays, FCCU catalyst
17	Leaded tank bottoms
18	Boiler house sludge
19 (2 units)	Solid waste, clays, spill cleanup
20	Iron sulfide
21	AFU (DAF) skimming
22	Boiler house sludge
23	AFU (DAF) skimmings
24	AFU (DAF) skimmings
25	Biological sludges
26	Coke pile
27	Caustic

AMOCO WHITING REFINERY
PROJECT: SW-2326 RA: 13919-08

Burns & McDonnell

J&L SITE WASTE DISPOSAL PIT DESCRIPTIONS

TABLE OF CONTENTS

1.1 REFINERY SYSTEMS

1.1.1 Upper Schrage/MEK J-136 Wellpoint

System Type. Wellpoint system with vacuum recovery devices.

System Purpose and Objective. The purpose of this system is to establish hydraulic gradient control and recover free phase hydrocarbon (FPH). The objective is to contain FPH to the Amoco property.

System Pumping Rate. 100 gpm average.

System Duration. As long as necessary to contain FPH to Amoco property.

Brief System Description. This interim system was installed in March 1993 and was designed to prevent the migration of hydrocarbons from Amoco's perimeter boundaries. Vacuum recovery devices were installed in tandem to the J-137 wellpoint system to recover FPH. The FPH recovery system is 2,000 feet long. Groundwater modeling has indicated the system should pump at 100 gpm to sustain the necessary hydraulic gradient control at this location. The water and FPH that is currently being removed is being sent to a process sewer. The FPH has been identified as a degraded refinery fuel oil.

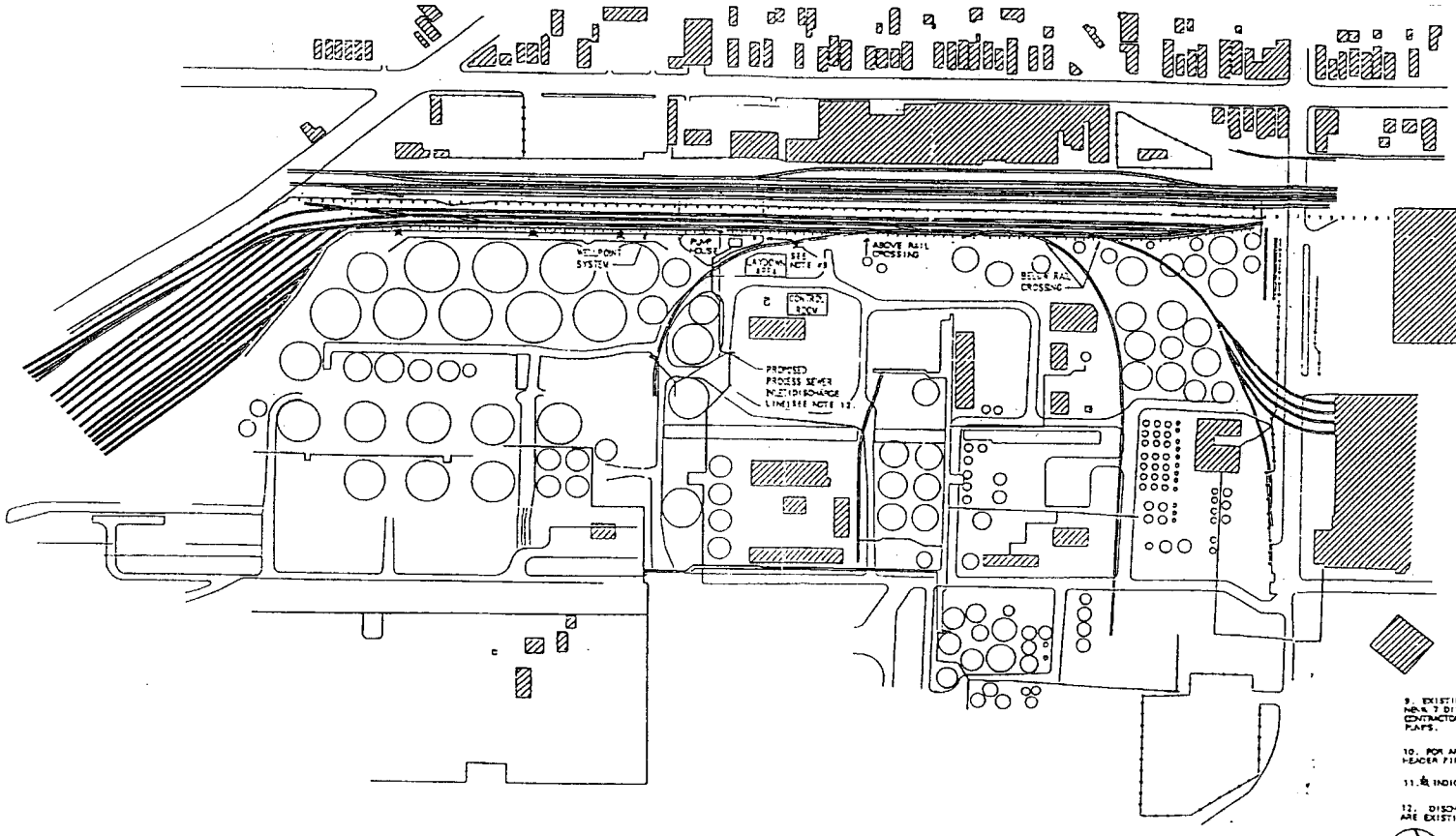
System Mechanics. Length is 2,000 feet, depth is 14 feet, and the material is carbon steel header pipe.

O&M: An O&M manual has been prepared for this system and is available at the Whiting Remediation Services Division file room.

Plot Plan. Figure No. 2, Burns & McDonnell proposal.

Performance Evaluations. Quarterly fluid levels taken to monitor groundwater gradient and FPH thickness and sentinel well monitoring program. The sentinel well monitoring program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. The wellpoint system must operate to allow vacuum recovery devices to operate and recover FPH.



NOTES:
1. WELLPOINT SYSTEM IS APPROXIMATELY 2000 LINEAR FEET.

2. WELLPOINT MUST BE 8' FROM CENTER OF THE EASTERN MOST SET OF TRACKS EXCEPT FOR AREA A.

3. WELLPOINTS ARE 10 FEET ON CENTER (200 TOTAL).

4. VRO WELLS ARE 10 FEET ON CENTER (200 TOTAL).

5. AREA A WELLPOINT MUST BE PLACED AGAINST ROADWAY.

6. AREA B WELLPOINT MUST BE A MINIMUM OF 3 FEET AWAY FROM TANKS.

7. BELOW GRADE RAIL CROSSINGS ARE TO ENSURE HEADER PIPE INTEGRITY AND RAIL INTEGRITY.

8. AREA C ROAD WIDTH WILL BE MAINTAINED 18 FEET FOR EMERGENCY VEHICLE USAGE.

9. EXISTING POWER POLES 3-10 AND NEW 2 DISCONNECTS ARE EXISTING. CONTRACTOR TO EXTEND POWER TO PUMPS.

10. FOR AREA C: HEADER PIPE MUST AVOID SWITCHES.

11. ⊗ INDICATES RAIL SWITCHES

12. DISCHARGE LINE ROAD CROSSINGS ARE EXISTING AND UNDERGROUND

Burns & McDonnell Waste Consultants Inc.

AMOCO OIL COMPANY

ENGINEERING DEPARTMENT WHITING INDIANA

Figure 2

LOCATION PLAN
PROPOSED UPPER SCHRADE/WEX
WELLPOINT SYSTEM
AMOCO WHITING REFINERY

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1.1.2 Berry Lake J-161

System Type. Wellpoint system

System Purpose and Objective. The purpose of this system is to establish hydraulic gradient control and recover FPH. The objective of the system is to create a hydraulic gradient toward the interior of Amoco's Whiting Refinery. This would shift the FPH cone of depression away from the East Chicago stormwater sewers.

System Pumping Rate. 90 gpm average.

System Duration. As long as necessary to contain FPH to Amoco property.

Brief System Description. This interim system was installed in 1992 and was relocated approximately 200 feet north of the original J-161 system. The system is 1,000 feet long and was relocated to move the FPH plume onsite. The system is currently discharging into the process sewer to be treated at the lakefront.

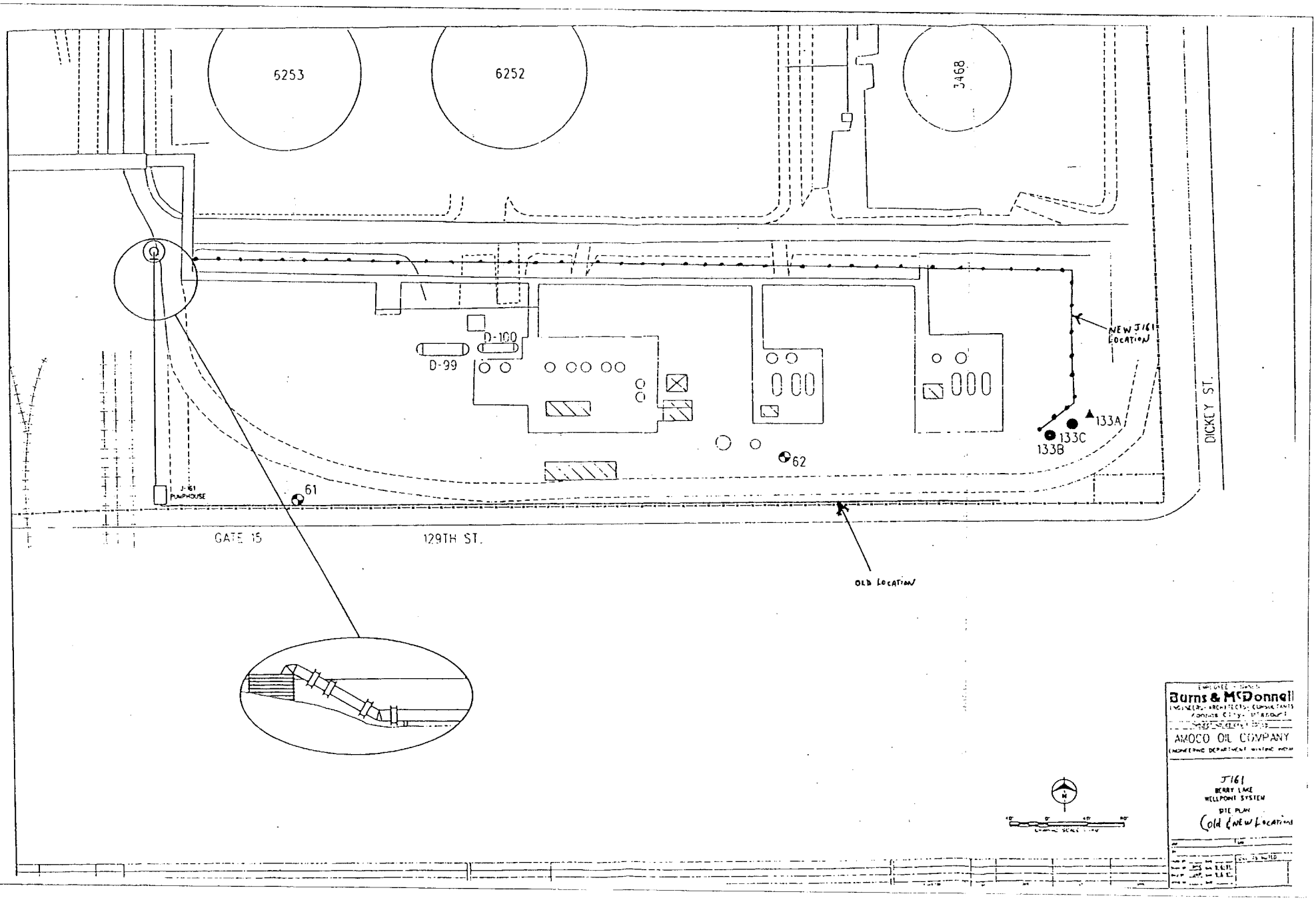
System Mechanics. The system is a stainless steel single vacuum pump and centrifugal pump arrangement. The pump is cooled by a water reservoir located inside the pump house.

O&M. The current O&M is performed by the Refinery Environmental Inspectors.

Plot Plan. (See attached remediation systems map.)

Performance Evaluations. Quarterly fluid levels taken to monitor groundwater gradient and FPH thickness and sentinel well monitoring program. The sentinel well monitoring program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. This system is not dependent on any other systems for hydraulic gradient control.


6253
6252
3468
D-100
D-99
NEW J161 LOCATION
133A
133C
133B
62
61
J-161 PUMPHOUSE
GATE 15
129TH ST.
DICKEY ST.
OLD LOCATION
Burns & McDonnell
ENGINEERS - ARCHITECTS - CONSULTANTS
AMOCO OIL COMPANY
J161
BERRY LAKE WELLPOINT SYSTEM
SITE PLAN
Cold & New Locations

1.1.3 Future Standard Avenue French Drain

System Type. French drain.

System Purpose and Objective. The purpose of this system is to establish inward hydraulic gradient control and recover FPH. The objective is to prevent FPH from reaching Lake Michigan and to prevent FPH on Standard Avenue.

System Pumping Rate. Final design of the system is not complete.

System Duration. Continuous operation in conjunction with periodic fluid level readings from monitoring wells.

Brief System Description. System installation is dependent on a pending real estate purchase that is necessary for placement of the system. The system is being installed to eliminate the natural gradient toward Lake Michigan and recover FPH.

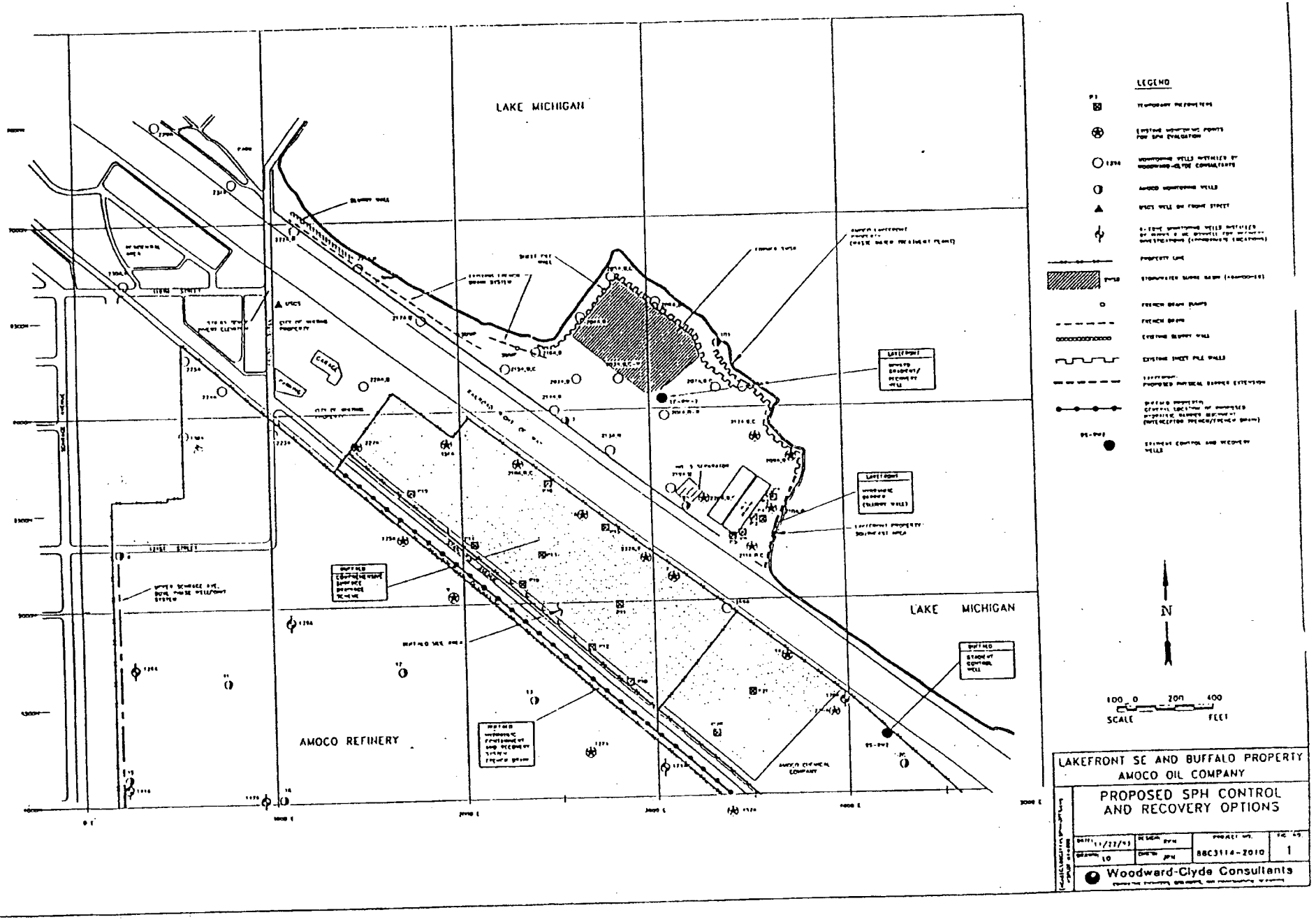
System Mechanics. The french drain will be constructed of horizontally installed well screens with filter packing material around the screen. The depth of the french drain will be approximately 15 feet deep.

O&M. After the installation of the Standard Avenue french drain an O&M manual will be prepared.

Plot Plan. Woodward-Clyde Consultants, Figure No. 1, Proposed FPH Control and Recovery Options (11/22/93).

Performance Evaluations. Future task. Quarterly fluid levels will be taken to monitor groundwater gradient and FPH thickness and sentinel well monitoring program. The sentinel well monitoring program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. This system is dependent upon the performance and operation of recovery wells RW-1 and RW-2 at the lakefront and Buffalo Side respectively.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LAKE MICHIGAN
AMOCO REFINERY
LEGEND
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100 0 200 400
SCALE FEET
LAKEFRONT SE AND BUFFALO PROPERTY
AMOCO OIL COMPANY
PROPOSED SPH CONTROL AND RECOVERY OPTIONS
11/22/93
JPH
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88C3114-2010
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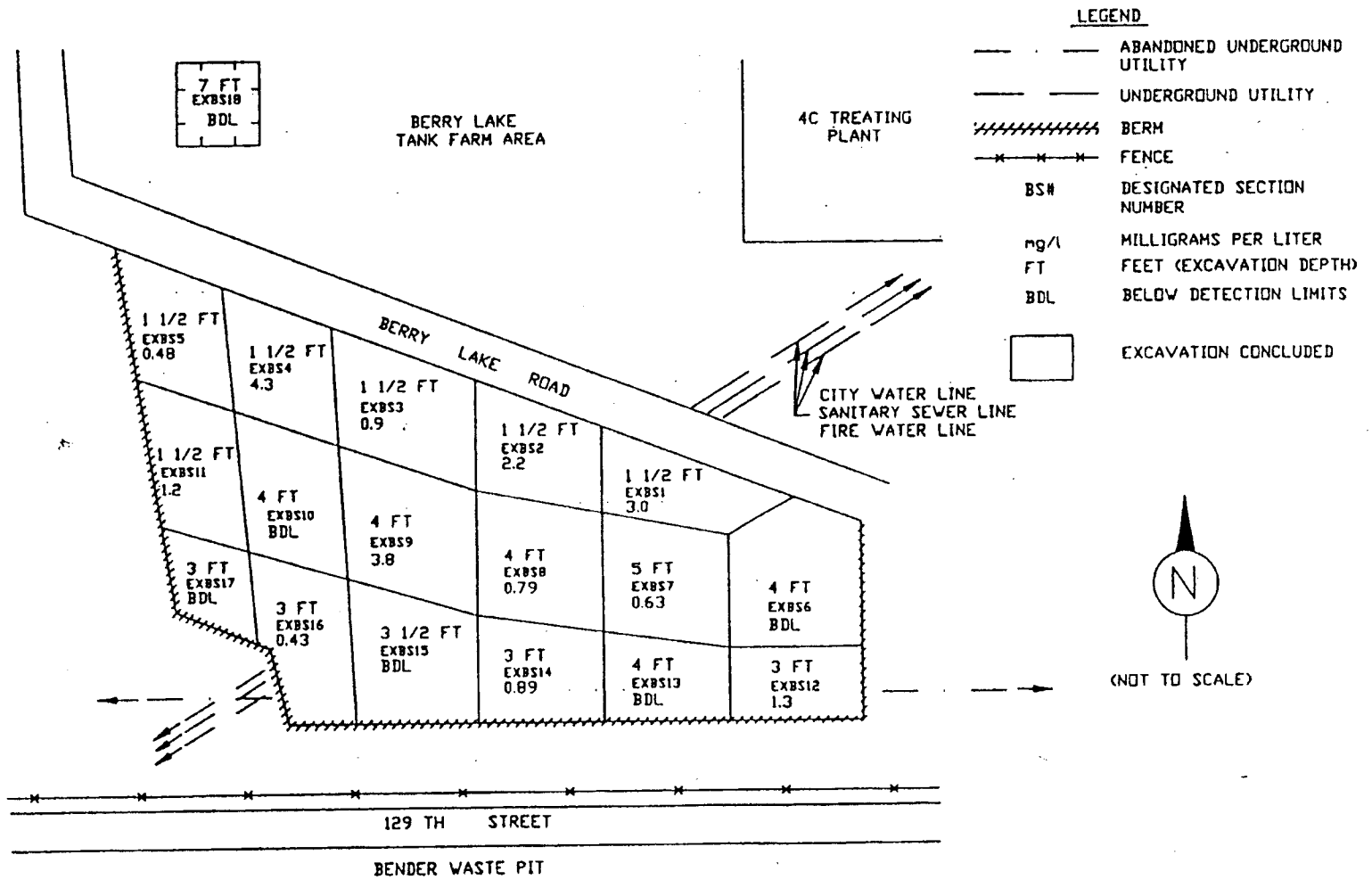
Woodward-Clyde Consultants



LEACHABLE LEAD LEVELS (mg/l) AT EXCAVATION SURFACE FOLLOWING EXCAVATION NO. 5

FIGURE 7

WCC, 88C3114-9100
AMOCO DWG 9100-7

1.1.4 Bender Waste

Remediation Type. Removal of contaminated soils from a Bender catalyst and clay filter material storage area located south of Berry Lake Tank Field area.

Remediation Purpose and Objective. The purpose of this remediation is to remove contaminated soil above the EP toxicity limit of 5.0 mg per liter of leachable lead. Samples were sent to EMS laboratory. All areas found to contain greater than 5 ppm toxicity criteria for leachable lead were excavated and disposed of at CID Landfill, Calumet City, Illinois.

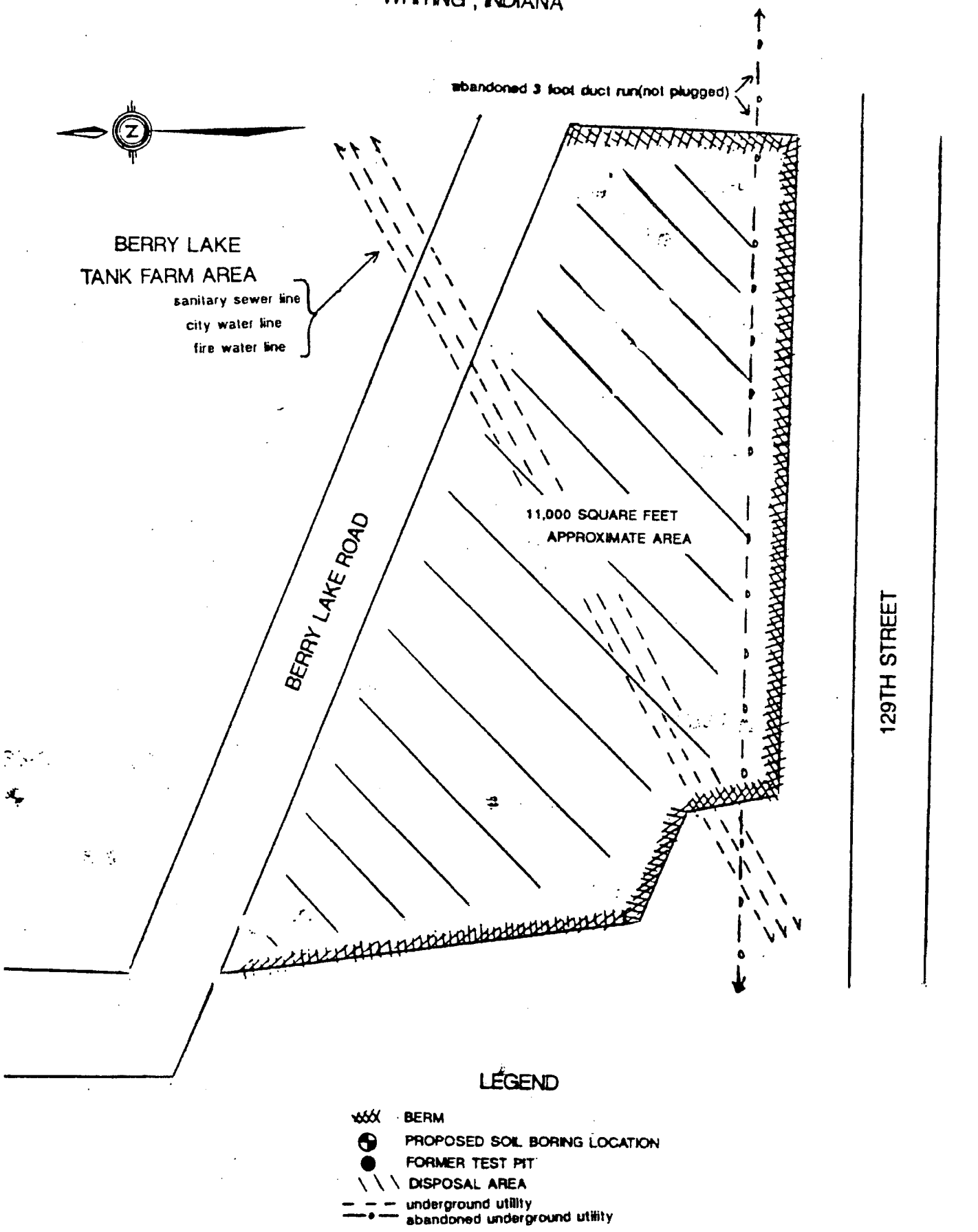
Remediation Duration. Soils were excavated and samples were taken. The duration of the remediation was approximately six weeks.

Brief System Description. Bender waste contains lead. ICEP Remediation was the contractor retained by Amoco to perform the excavation to remove soils in contact with the bender catalyst. The bender waste consists primarily of sand and gravel and was transported to CID Landfill located in Calumet City, Illinois under waste disposal permit number 822899. Approximately 1,300 cubic yards were disposed between April 18, 1990 through May 30, 1990.

Drawing Nos. Available. Berry Lake Tank Farm area, Woodward-Clyde Consultants Figure No. 1. Leachable lead levels (mg/l) at excavation surface following Excavation No. 5, Woodward-Clyde Consultants Figure 7.

AMOCO OIL REFINERY
WHITING , INDIANA

FIGURE 1



WCC, 88C3114.9100

NOT TO SCALE

1.1.5 Buffalo Side Recovery Well BSRW-2

System Type. Large diameter recovery well, two sump system.

System Purpose and Objective. The purpose of this system is to establish inward hydraulic gradient control and recover FPH. The objective is to prevent FPH from reaching Lake Michigan.

System Pumping Rate. 15 gpm.

System Duration. Monitoring of the effects of the Buffalo Side French Drain and the recovery well will establish the long term pumping rate for this well.

Brief System Description. The system was operational March 1994 and was designed to create an inward groundwater gradient condition within the area of the Buffalo Side property behind the southern most portion of the future Buffalo Side French Drain.

System Mechanics. The system contains one WMRS model no. 4008-02-FX2 combination explosion proof electric and pneumatic FPH only piston pump and one Grundfos electric submersible rediflo pump model #10E5 with 460 volt, 3 phase, 0.33 HP motor. Well design and installation includes:

- drilled to a nominal diameter of 24 inches;
- drilled to a final depth of 28 feet;
- a screened interval of 8 feet to 20 feet;
- a basal sump of 5 feet (20 to 25 foot depth);
- 12 inch I.D. well screen and riser comprising 316 stainless steel, wirewrap, and having a number 6 slot size (0.006 inch) opening;
- a sand filter pack of Colorado silica #32 and #40;
- a top seal comprising a 2 foot cement bentonite grout; and
- a 4x6x3 foot deep manhole vault with manhole cover.

O&M. An O&M procedure was prepared by Woodward-Clyde Consultants.

Plot Plan. Propylene storage facility proposed recovery well location plan, Woodward-Clyde Consultants, Figure No. 2, 11/2/93, Project No. 88C3114-2051.

Performance Evaluations. A well pumping yield test was performed 6/94 by Woodward-Clyde Consultants.

System Dependencies. This system was designed to run in tandem with the Buffalo Side French Drain system, and the installation of the slurry wall along the south east side of the lakefront property.

1.1.6 Refinery, South Tank Field, and Indiana Tank Field Recovery Wells

System Type. Dual phase recovery wells.

System Purpose and Objective. The purpose of this system is to establish hydraulic gradient control and recover FPH. The objective is to remove FPH from the subsurface along Indianapolis Boulevard north of Gate 20, northwest of Tank 3528 in South Tank Field, and south of Tank 3716 in Indiana Tank Field.

System Pumping Rate. 15 gpm per well.

System Duration. System will be in place until FPH is recovered or objectives are changed.

Brief System Description. Eight dual phase recovery wells will be operational by the third quarter 1995.

System Mechanics. The system contains one WES model PRP-3x3 pneumatic product pump and one Grundfos electrical submersible rediflo pump model #16E9 with 460 volt, 3 phase, 1.0 HP motor. Well design and installation includes:

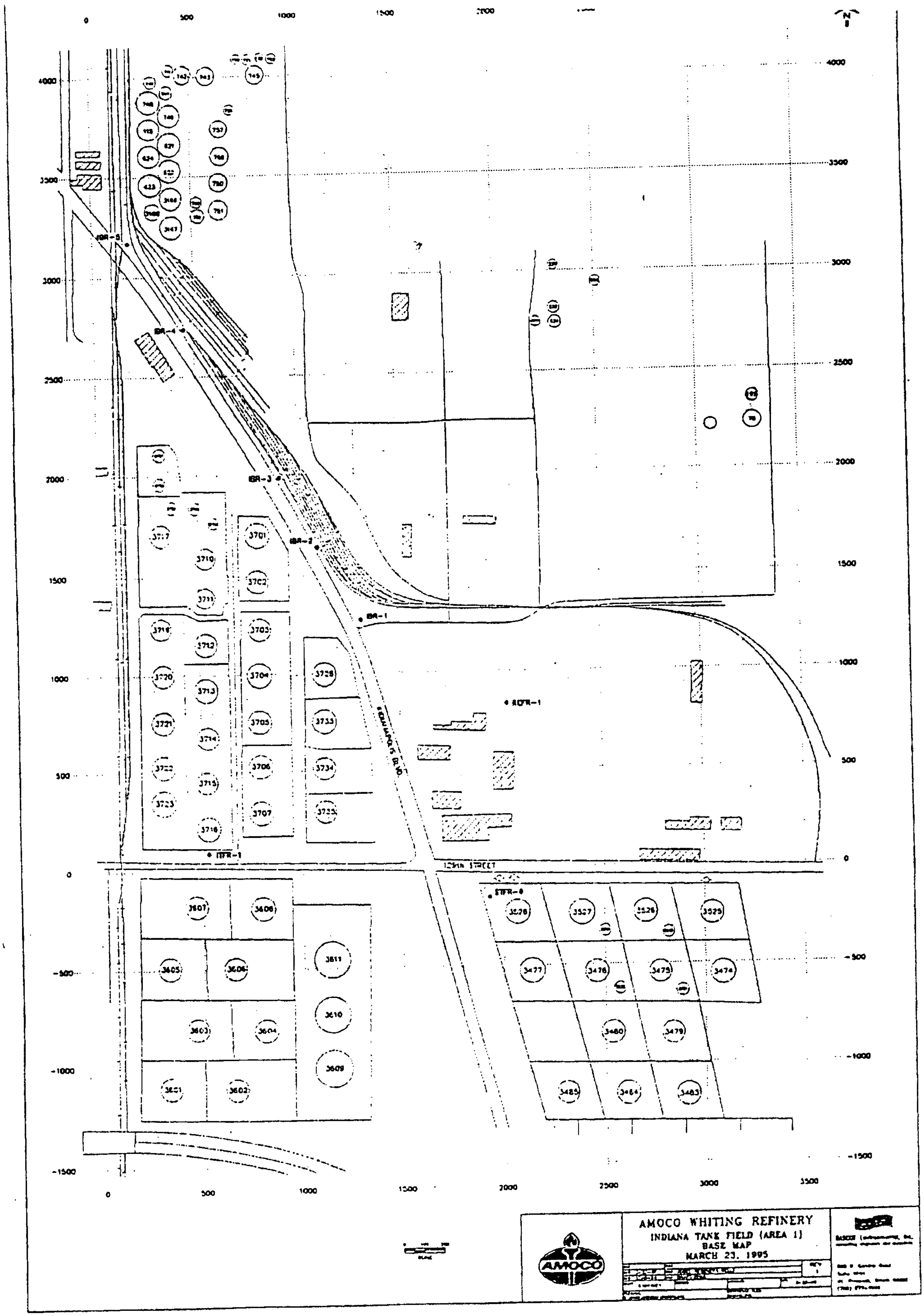
- drilled to a nominal diameter of 24 inches;
- drilled to final depths of approximately 20 feet bgs.;
- a screened interval of approximately 13 feet;
- a basal sump of 2 feet;
- 12-inch ID 20-slot (0.020 inch) stainless steel well screen;
- a filter pack of Morie #1 silica sand;
- a top seal of approximately 6 to 12 inches of hydrated bentonite; and
- a 3x3x4 foot deep manhole vault with cover (except Indiana Tank Field and South Tank Field wells).

O&M. An O&M procedure is being prepared by Burns & McDonnell.

Plot Plan. Refinery, South Tank Field, and Indiana Tank Field Recovery Well, Figure #1.

Performance Evaluations. System not completed as of March 24, 1995, although quarterly fluid levels will be taken to monitor groundwater gradients and FPH thickness and sentinel well monitoring program. The sentinel well program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. These systems are not dependent on any other systems for hydraulic gradient control.


AMOCO WHITING REFINERY
INDIANA TANK FIELD (AREA 1)
BASE MAP
MARCH 23, 1995
AMOCO
129th STREET
INDIANAPOLIS BLVD.
IBR-1
IBR-2
IBR-3
IBR-4
IBR-5
ITFR-1
STFR-8
AOTR-1
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757

1.2 LAKEFRONT SYSTEMS

1.2.1. French Drain Slurry Wall Systems

System Type. French drain, hanging corrugated metal/bentonite cement barrier wall.

System Purpose and Objective. The purpose of these systems is to recover FPH. The objective is to provide a positive barrier and recover FPH at this location to prevent FPH from reaching Lake Michigan.

System Pumping Rate. The system is designed to pump between 80 gpm to 100 gpm.

System Duration. Continuous operation in conjunction with periodic fluid level readings from monitoring wells.

Brief System Description. The french drain system consists of an existing and new west french drain system and an east french drain system. The existing east, west and new west french drain systems were installed in 1969, 1970, and 1992 respectively. The typical french drain is installed approximately 8 feet below natural grade. The trench 6 feet deep and 6 feet wide is filled with pea gravel. Two pipes are installed in the french drains at a depth of approximately 3.5 and 5.5 feet into the pea gravel. The upper pipe run is an 8-inch slotted high density polyethylene pipe and the lower pipe run is a 12-inch slotted high density polyethylene pipe. A geotextile is installed over the pea gravel trench which acts as a filter for infiltrating water. A test pipe is installed in the gravel trench to facilitate sampling and monitoring of subsurface conditions. The test pipe is a 2-inch stainless steel slotted well screen 4-feet long installed in the gravel trench with a 2-inch stainless steel riser pipe to the surface. The gravel trench is finished to the surface with compacted backfill.

The gravel trenches gravity drain to sumps for recovery of petroleum hydrocarbons and the affected water. The existing west french drain and east french drain system sumps are approximately 7.0 and 4.5 feet in diameter, respectively. The east sump is located in the middle of the gravel trench between the oil test pipes W-1 and E-1. A dual pumping system is installed in the east sump to recover FPH collected in the french drain. The dual pumping system includes two recovery pumps, float level controllers, flow totalizer, and associated piping and hardware. The existing west sump is located about 150 feet from the southern end of the existing west french drain system. The sump utilized a dual pumping system similar to the east french drain system to collect and recover FPH. The new west sump is an 8-foot precast concrete sump installed to a depth of 19 feet below grade with a 3 foot stick up. The new west sump is located at the southern end of the new west sump french drain system and connects the new and existing west french drain systems. The new west sump contains one recovery pump, float level controllers, a flow totalizer, and associated piping and hardware for recovery of petroleum hydrocarbons and affected water.

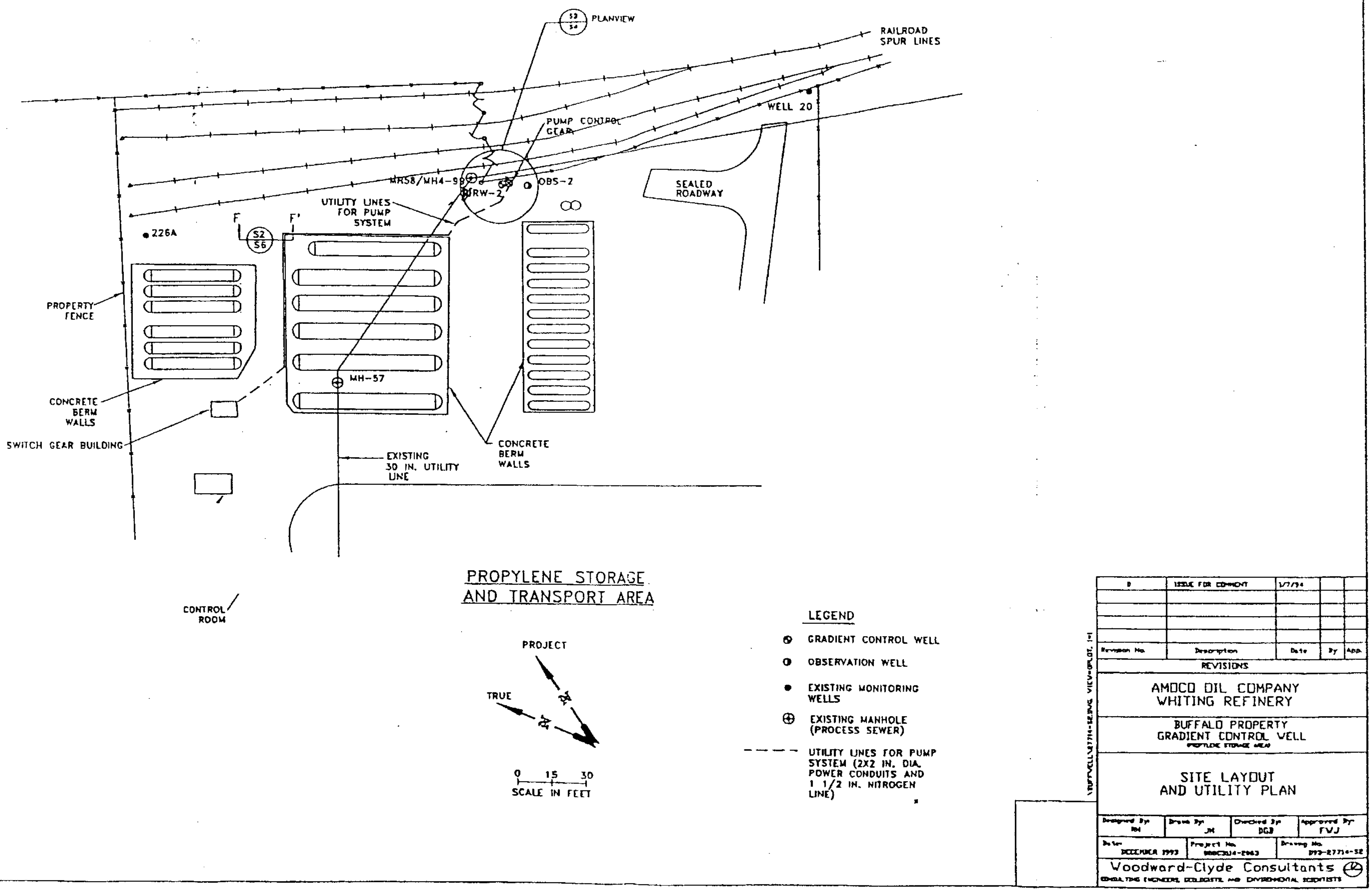
System Mechanics. An O&M manual has been prepared by Woodward-Clyde Consultants.

O&M. The manual is entitled "Lakefront French Drain System East and West French Drains".

Plot Plan. Woodward-Clyde Consultants drawing, Lakefront Groundwater Investigation West French Drain System Location Plan, 9/91, 88C3114-1216.

Performance Evaluations. Quarterly fluid levels taken to monitor groundwater gradient and FPH thickness.

System Dependencies. The french drain is not dependent on any other systems.


PLANVIEW
S3
S4
RAILROAD
SPUR LINES
WELL 20
PUMP CONTROL
GEAR
MH58/MH4-99
RW-2
OBS-2
SEALED
ROADWAY
UTILITY LINES
FOR PUMP
SYSTEM
F
F'
S2
S6
226A
PROPERTY
FENCE
MH-57
CONCRETE
BERM
WALLS
SWITCH GEAR BUILDING
EXISTING
30 IN. UTILITY
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CONCRETE
BERM
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PROPYLENE STORAGE
AND TRANSPORT AREA
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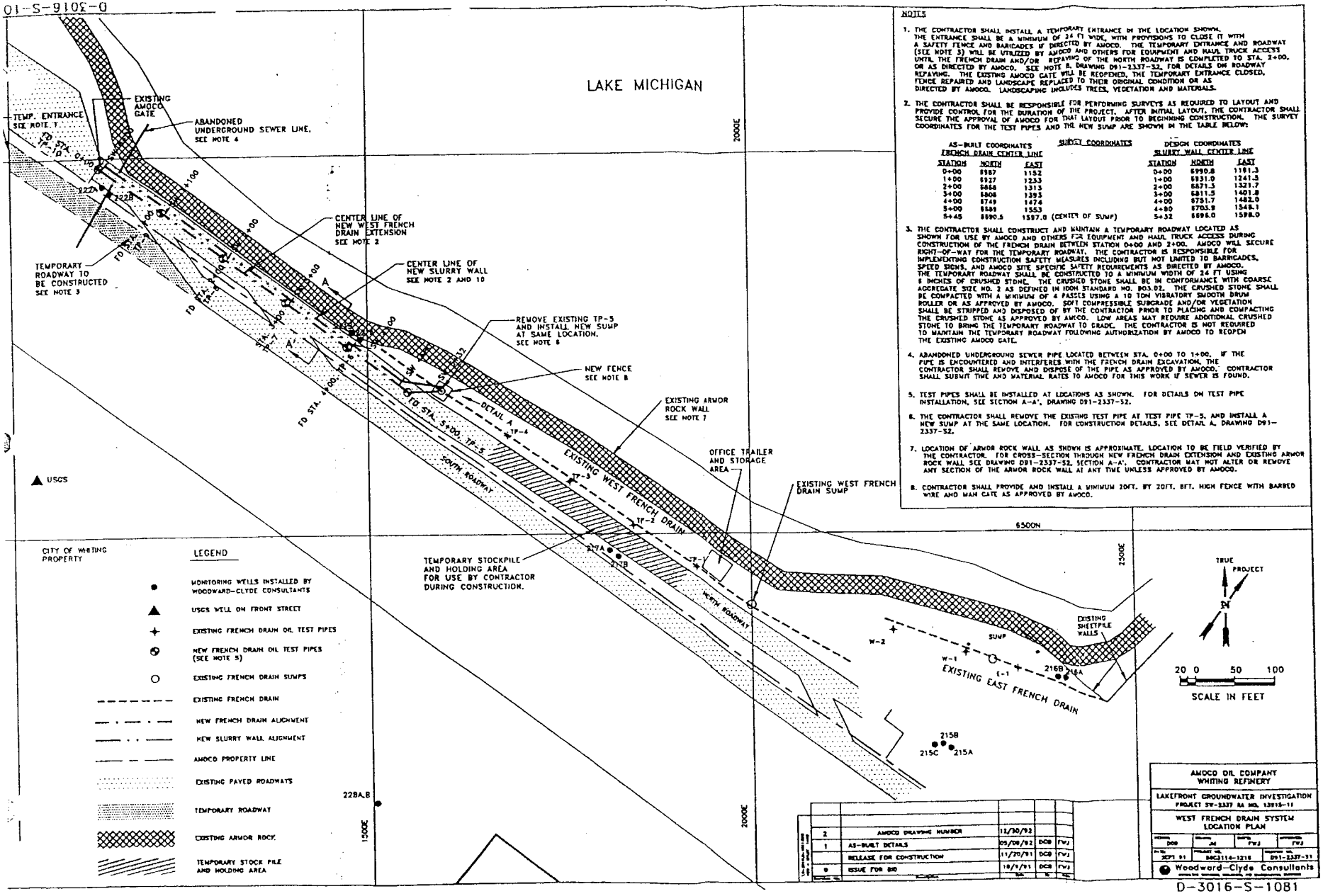
ISSUE FOR COMMENT
1/7/94
Revision No.
Description
Date
By
App.
REVISIONS
AMOCO OIL COMPANY
WHITING REFINERY
BUFFALO PROPERTY
GRADIENT CONTROL WELL
SITE LAYOUT
AND UTILITY PLAN
Designed By
Drawn By
JM
Checked By
DGB
Approved By
TVJ
Date:
DECEMBER 1993
Project No.
Drawing No.
Woodward-Clyde Consultants

D-3016-S-10



NOTES

1. THE CONTRACTOR SHALL INSTALL A TEMPORARY ENTRANCE IN THE LOCATION SHOWN. THE ENTRANCE SHALL BE A MINIMUM OF 24 FT WIDE, WITH PROVISIONS TO CLOSE IT WITH A SAFETY FENCE AND BARRICADES IF DIRECTED BY AMOCO. THE TEMPORARY ENTRANCE AND ROADWAY (SEE NOTE 3) WILL BE UTILIZED BY AMOCO AND OTHERS FOR EQUIPMENT AND HAUL TRUCK ACCESS UNTIL THE FRENCH DRAIN AND/OR REPAVING OF THE NORTH ROADWAY IS COMPLETED TO STA. 2+00, OR AS DIRECTED BY AMOCO. SEE NOTE 8, DRAWING D91-2337-S2, FOR DETAILS ON ROADWAY REPAVING. THE EXISTING AMOCO GATE WILL BE REOPENED, THE TEMPORARY ENTRANCE CLOSED, FENCE REPAIRED AND LANDSCAPE REPLACED TO THEIR ORIGINAL CONDITION OR AS DIRECTED BY AMOCO. LANDSCAPING INCLUDES TREES, VEGETATION AND MATERIALS.

2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PERFORMING SURVEYS AS REQUIRED TO LAYOUT AND PROVIDE CONTROL FOR THE DURATION OF THE PROJECT. AFTER INITIAL LAYOUT, THE CONTRACTOR SHALL SECURE THE APPROVAL OF AMOCO FOR THAT LAYOUT PRIOR TO BEGINNING CONSTRUCTION. THE SURVEY COORDINATES FOR THE TEST PIPES AND THE NEW SUMP ARE SHOWN IN THE TABLE BELOW:

AS-BUILT COORDINATES FRENCH DRAIN CENTER LINE			SURVEY COORDINATES	DESIGN COORDINATES SLURRY WALL CENTER LINE		
STATION	NORTH	EAST		STATION	NORTH	EAST
0+00	8987	1152		0+00	6990.8	1181.3
1+00	8927	1233		1+00	6931.0	1241.5
2+00	8868	1315		2+00	6871.5	1321.7
3+00	8808	1395		3+00	6811.5	1401.8
4+00	8749	1474		4+00	6751.7	1482.0
5+00	8689	1553		4+80	6703.9	1548.1
5+45	8660.5	1587.0	(CENTER OF SUMP)	5+32	6698.0	1598.0

3. THE CONTRACTOR SHALL CONSTRUCT AND MAINTAIN A TEMPORARY ROADWAY LOCATED AS SHOWN FOR USE BY AMOCO AND OTHERS FOR EQUIPMENT AND HAUL TRUCK ACCESS DURING CONSTRUCTION OF THE FRENCH DRAIN BETWEEN STATION 0+00 AND 2+00. AMOCO WILL SECURE RIGHT-OF-WAY FOR THE TEMPORARY ROADWAY. THE CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTING CONSTRUCTION SAFETY MEASURES INCLUDING BUT NOT LIMITED TO BARRICADES, SPEED SIGNS, AND AMOCO SITE SPECIFIC SAFETY REQUIREMENTS AS DIRECTED BY AMOCO. THE TEMPORARY ROADWAY SHALL BE CONSTRUCTED TO A MINIMUM WIDTH OF 24 FT USING 6 INCHES OF CRUSHED STONE. THE CRUSHED STONE SHALL BE IN CONFORMANCE WITH COARSE AGGREGATE SIZE NO. 2 AS DEFINED IN IDOM STANDARD NO. 903.02. THE CRUSHED STONE SHALL BE COMPACTED WITH A MINIMUM OF 4 PASSES USING A 10 TON VIBRATORY SMOOTH DRUM ROLLER OR AS APPROVED BY AMOCO. SOFT COMPRESSIBLE SUBGRADE AND/OR VEGETATION SHALL BE STRIPPED AND DISPOSED OF BY THE CONTRACTOR PRIOR TO PLACING AND COMPACTING THE CRUSHED STONE AS APPROVED BY AMOCO. LOW AREAS MAY REQUIRE ADDITIONAL CRUSHED STONE TO BRING THE TEMPORARY ROADWAY TO GRADE. THE CONTRACTOR IS NOT REQUIRED TO MAINTAIN THE TEMPORARY ROADWAY FOLLOWING AUTHORIZATION BY AMOCO TO REOPEN THE EXISTING AMOCO GATE.

4. ABANDONED UNDERGROUND SEWER PIPE LOCATED BETWEEN STA. 0+00 TO 1+00. IF THE PIPE IS ENCOUNTERED AND INTERFERES WITH THE FRENCH DRAIN EXCAVATION, THE CONTRACTOR SHALL REMOVE AND DISPOSE OF THE PIPE AS APPROVED BY AMOCO. CONTRACTOR SHALL SUBMIT TIME AND MATERIAL RATES TO AMOCO FOR THIS WORK IF SEWER IS FOUND.

5. TEST PIPES SHALL BE INSTALLED AT LOCATIONS AS SHOWN. FOR DETAILS ON TEST PIPE INSTALLATION, SEE SECTION A-A', DRAWING D91-2337-S2.

6. THE CONTRACTOR SHALL REMOVE THE EXISTING TEST PIPE AT TEST PIPE TP-5, AND INSTALL A NEW SUMP AT THE SAME LOCATION. FOR CONSTRUCTION DETAILS, SEE DETAIL A, DRAWING D91-2337-S2.

7. LOCATION OF ARMOR ROCK WALL AS SHOWN IS APPROXIMATE. LOCATION TO BE FIELD VERIFIED BY THE CONTRACTOR. FOR CROSS-SECTION THROUGH NEW FRENCH DRAIN EXTENSION AND EXISTING ARMOR ROCK WALL SEE DRAWING D91-2337-S2, SECTION A-A'. CONTRACTOR MAY NOT ALTER OR REMOVE ANY SECTION OF THE ARMOR ROCK WALL AT ANY TIME UNLESS APPROVED BY AMOCO.

8. CONTRACTOR SHALL PROVIDE AND INSTALL A MINIMUM 20FT. BY 20FT. 8FT. HIGH FENCE WITH BARBED WIRE AND MAN GATE AS APPROVED BY AMOCO.

NO.	REVISION	DATE	DES	CHK
2	AMOCO DRAWING NUMBER	12/30/92		
1	AS-BUILT DETAILS	05/08/92	DCB	FWJ
	RELEASE FOR CONSTRUCTION	11/20/91	DCB	FWJ
0	ISSUE FOR BID	10/9/91	DCB	FWJ

AMOCO OIL COMPANY
WHITING REFINERY

LAKEFRONT GROUNDWATER INVESTIGATION
PROJECT SW-2337 RA NOL 13916-11

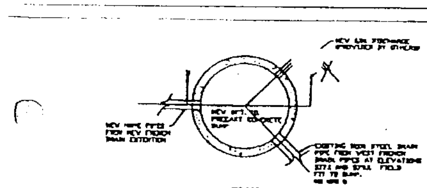
WEST FRENCH DRAIN SYSTEM
LOCATION PLAN

DESIGNED	DRAWN	CHECKED	APPROVED
DCB	JM	FWJ	FWJ

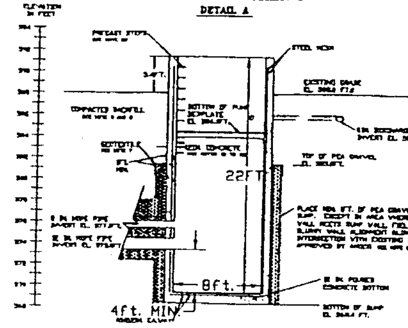
JOB NO.	PROJECT NO.	DRAWING NO.
3071 91	84C3114-1216	D91-2337-S1

Woodward-Clyde Consultants

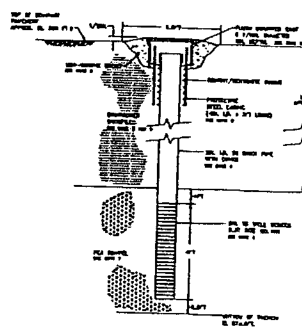
D-3016-S-1081



PLAN
PIPE CONNECTIONS TO SUMP
DETAIL A



NEW PRECAST CONCRETE SUMP
SECTION B-B'



TEST PIPE DESIGN
DETAIL B

NOTES

1. ACCESS TO THE LAKEFRONT PROPERTY MUST BE MAINTAINED AT ALL TIMES BY THE CONTRACTOR FOR THE DURATION OF CONSTRUCTION. SEE NOTES 1 AND 2 ON DRAWING 291-2337-10 FOR DETAILS.

2. THE TOP WIDTH OF THE EXCAVATION FOR THE NEW FRENCH DRAIN SHALL NOT EXCEED 24 FT. UNLESS OTHERWISE APPROVED BY AMOCO. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DESIGN OF EXCAVATION FOR THE FRENCH DRAIN AND NEW SUMP INCLUDING LATERAL SUPPORT SYSTEMS AS NEEDED. ALL LATERAL SUPPORT SYSTEMS SHALL BE DESIGNED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF INDIANA. EXCAVATION DESIGN AND CONSTRUCTION SHALL BE IN CONFORMANCE WITH OSHA CONSTRUCTION SAFETY STANDARDS, TITLE 29 CFR 1926.

THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR DESIGN AND TEMPORARY INSTALLATION AND OPERATION OF TEMPORARY CONSTRUCTION DEWATERING SYSTEMS. THE CONTRACTOR'S DEWATERING SYSTEM SHALL NOT PUMP SAND AND SHALL PROVIDE FOR CONTROLLED DISCHARGE WITH FILTERING DEVICES IF NEEDED, TO THE EXISTING WEST FRENCH DRAIN SUMP OR AS DIRECTED BY AMOCO.

GROUNDWATER LEVELS AS SHOWN ARE BASED ON NEARBY MONITORING WELL READINGS MEASURED PERIODICALLY BY AMOCO. CONTRACTOR SHALL OBTAIN MOST RECENT GROUNDWATER LEVEL DATA FROM AMOCO ONSITE, AND MAY MAKE HIS OWN MEASUREMENTS WITH AMOCO APPROVAL. RAINFALL AND/OR FLUCTUATIONS IN THE LEVEL OF LAKE MICHIGAN MAY IMPACT GROUNDWATER LEVELS IN THE EXCAVATIONS FOR THE NEW FRENCH DRAIN EXTENSION. HISTORIC LOW AND HIGH WATER LEVELS FOR LAKE MICHIGAN RANGE BETWEEN EL. 577.2 FT AND EL. 582.3 FT, RESPECTIVELY. ALL ELEVATIONS REFERENCED TO MEAN SEA LEVEL DATUM NGVD.

PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL SUBMIT HIS EXCAVATION, DEWATERING, CONSTRUCTION AND HEALTH AND SAFETY WORK PLANS TO AMOCO FOR APPROVAL. SUBMITTAL SHALL BE AT LEAST THREE WORKING DAYS PRIOR TO THE START OF CONSTRUCTION.

3. MATERIALS FROM THE FRENCH DRAIN EXCAVATION WILL BE OBSERVED UNDER THE SUPERVISION OF AMOCO AND STOCKPILED AS DIRECTED BY AMOCO. SOILS DETERMINED TO BE UNSUITABLE FOR USE AS BACKFILL BY AMOCO SHALL BE HAULED TO ON-SITE DISPOSAL LOCATION LOCATED ON [illegible] STREET IN THE [illegible] SITE, OR WHEELER LANDFILL IN WHEELER INDIANA BY THE CONTRACTOR AS DIRECTED BY AMOCO. HAUL TRUCKS SHALL BE LEAK PROOF. REMAINING MATERIALS APPROVED BY AMOCO SHALL BE STOCKPILED AND REUSED AS BACKFILL IN THE FRENCH DRAIN EXCAVATION. STOCKPILED MATERIAL SHALL NOT BE STORED ANY CLOSER THAN 5 FT FROM THE EDGE OF ANY EXCAVATIONS. AN AREA LOCATED EAST OF THE WORK AREA ON THE NORTH ROADWAY AS SHOWN ON THE DRAWINGS SHALL BE USED AS A TEMPORARY STOCKPILE AREA BY THE CONTRACTOR AS APPROVED BY AMOCO. IF EXCESS STOCKPILED MATERIAL REMAINS AFTER COMPLETING THE WORK, THE CONTRACTOR SHALL LOAD AND HAUL TO THE [illegible] SITE OR AS DIRECTED BY AMOCO.

THE BALANCE OF MATERIAL NEEDED TO COMPLETE THE EXCAVATION BACKFILL SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL CONFORM TO THE FOLLOWING MATERIAL SPECIFICATIONS:

- UNIFIED SOIL CLASSIFICATION - SP OR SP-SM
- PERCENT PASSING NO. 200 SIEVE - LESS THAN 15%
- PERCENT RETAINED ON 3/4 IN. SIEVE - LESS THAN 5 %

4. HDPE PIPE SHALL BE USED IN THE CONSTRUCTION OF THE SLOTTED FRENCH DRAIN PIPES. STAINLESS STEEL SHALL BE USED IN THE CONSTRUCTION OF THE TEST PIPES. HDPE PIPE SHALL BE IN CONFORMANCE WITH ASTM-D3350.

SLOTTED HDPE PIPE: WHERE SLOTTED PIPE IS SPECIFIED, SLOTS SHALL BE [illegible] AT 30 SLOTS/ROW/FT.

TEST PIPE SCREENS: STAINLESS STEEL SCREENS FOR TEST PIPES SHALL BE SLOTTED WITH SIZE NO. 100 (SLOT WIDTH - 0.10 IN.). FOR CONSTRUCTION DETAILS ON THE TEST PIPE SEE DETAIL B.

PIPE SHALL BE SET AT LOCATIONS AND INVERTS AS SHOWN UNLESS OTHERWISE APPROVED BY AMOCO. BACKFILLING WITH PEA GRAVEL OVER PIPES SHALL NOT PROCEED UNTIL PIPE INSTALLATION IS APPROVED BY AMOCO.

SLOTTED DRAIN PIPES FROM THE EXISTING WEST FRENCH DRAIN SHALL BE CONNECTED TO THE NEW SUMP AS SHOWN ON THE DRAWINGS. FIELD ADJUSTMENTS AND ADDITIONAL SECTIONS OF PIPE MAY BE NECESSARY.

5. THE 4 IN. STEEL CASING USED TO PROTECT THE TEST PIPE RISER SHALL BE IN COMPLIANCE WITH DIMENSIONAL AND MATERIAL REQUIREMENTS GIVEN IN ASTM-A53. THE STEEL PIPE SHALL BE SECURED INPLACE USING A STIFF CEMENT/BENTONITE GROUT AS SHOWN ON DETAIL B.

THE COVER FOR THE OIL TEST PIPES SHALL BE A FLUSH MOUNTED CAST IRON COVER MANUFACTURED BY GLOBAL DRILLING SUPPLIES INC. OR APPROVED EQUAL. THE COVER SHALL BE SET INPLACE AS SHOWN ON DETAIL B USING [illegible] HIGH PERFORMANCE NON-SHRINK GROUT MANUFACTURED BY DAYTON SUPERIOR OREGON, ILLINOIS OR APPROVED EQUIVALENT.

6. PEA GRAVEL SHALL BE IN CONFORMANCE WITH COARSE AGGREGATE SIZE NO. 8, CLASS C QUALITY OR HIGHER AS DEFINED IN IDOH STANDARD NO. [illegible]. CARE SHALL BE USED IN BACKFILLING WITH PEA GRAVEL TO PREVENT VOIDS IN THE BACKFILL DUE TO BRIDGING. CONTRACTOR SHALL PROVIDE NOMINAL COMPACTION TO THE PEA GRAVEL PRIOR TO PLACING THE HIGHER SLOTTED PIPE AND PRIOR TO PLACEMENT OF THE GEOTEXTILE FABRIC.

7. GEOTEXTILE SHALL BE AMOCO NON-WOVEN FILTER FABRIC NO. #350 OR APPROVED EQUIVALENT. GEOTEXTILE SHALL BE INSTALLED AS SHOWN ON THE DRAWINGS OR AS DIRECTED BY AMOCO. OVERLAPPING OF GEOTEXTILE SHALL BE A MINIMUM OF 12 IN. HANDLING AND INSTALLATION SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS. PUNCTURED OR DAMAGED FILTER FABRIC SHALL NOT BE USED.

8. BACKFILL SHALL BE PLACED IN MAX. 9 IN. LOOSE LIFTS AND COMPACTED TO 95 PERCENT OF THE MODIFIED PROCTOR MAXIMUM DRY DENSITY (ASTM-D1557, METHOD D). AMOCO WILL PERFORM DENSITY TESTS IN PLACE AS REQUIRED TO VERIFY BACKFILL IS COMPACTED TO THE REQUIRED SPECIFICATIONS.

9. THE ALIGNMENT OF THE SLURRY WALL SHALL BE LOCATED AS CLOSE TO THE LAKEFRONT RIPRAP AS POSSIBLE AND SHALL BE SURVEYED BY THE CONTRACTOR AND APPROVED BY AMOCO PRIOR TO CONSTRUCTION. THE EXISTING AMOCO MONITORING WELLS MUST NOT BE DAMAGED. ANY DAMAGE WILL BE REPAIRED AT THE CONTRACTORS EXPENSE AS DIRECTED BY AMOCO.

IF THE LOCATION OF THE SLURRY WALL IS BENEATH THE ASPHALT ROAD, THE TOP 2 FT. OF WALL SHALL BE REPLACED WITH ROAD SUBBASE AND COMPACTED PRIOR TO PLACING ASPHALT SURFACE.

THE SOIL BENTONITE (SB) SLURRY WALL SPECIFICATIONS ARE AS FOLLOWS:

BENTONITE:	PREMIUM GRADE 90 BARREL YIELD MEETING API 13A SPECIFICATIONS DATA SUPPLIED BY CONTRACTOR.
SLURRY:	DENSITY - PFR 64.0 lb/cft VISCOSITY - MARSH FUNNEL ≥ 40 sec
INTRENCH SLURRY:	SLURRY LEVEL MAINTAINED 2 FT. OR LESS FROM SURFACE. INTRENCH DENSITY AND VISCOSITY SAME AS ABOVE.
SOIL BENTONITE BACKFILL IF SB METHOD USED:	HYDRAULIC CONDUCTIVITY ≤ 1 10^{-6} cm/sec FINES CONTENT, ATTEMPT 15% MIN. SEE SOIL MATERIAL FROM TRENCH AND IMPORTED SOIL MIXED ADJACENT TO TRENCH. SLUMP (ASTM C-143) 2 TO 6 IN. BACKFILLED ACCORDING TO INDUSTRY STANDARDS
CB SLURRY IF USED:	DENSITY ≥ 62 lb/ft^3 HYDRAULIC CONDUCTIVITY ≤ 10^{-6} cm/sec AT 28 DAYS AGE UNCONFINED COMPRESSIVE STRENGTH ≥ [illegible] AT 7 DAYS AGE PANEL OVERLAP - 2 FT EACH BAY MIX DESIGN AND EQUIPMENT SUBMITTED WITH WORK PLAN FOR AMOCO APPROVAL

EXCAVATED SOIL AND SLURRY HAULED TO [illegible] SITE OR AS DIRECTED BY AMOCO.

10. ROADWAY SHALL BE REPLACED FOLLOWING COMPLETION AND APPROVAL BY AMOCO OF COMPACTED BACKFILL AND SLURRY WALL. ASPHALT ROADWAY PAVING SHALL BE IN CONFORMANCE TO THE FOLLOWING DESIGN AS DEFINED IN IDOH STANDARD SPECIFICATIONS NO. 402, 403, AND 903:

- SURFACE COURSE: NOT LESS THAN 3 IN. OF CLASS B ASPHALTIC CEMENT, WITH A MINIMUM MARSHALL STABILITY OF 300 AND
- BASE COURSE: NOT LESS THAN 9 IN. STABILIZED GRANULAR AGGREGATE TYPE A

AMOCO MAY DIRECT THE CONTRACTOR TO MATCH THE EXISTING ROADWAY PAVEMENT DESIGN IN LIEU OF THE DESIGN SPECIFIED HEREIN. PAVEMENT SHALL BE CROWNED WITH NEW ROADWAY SURFACE ELEVATIONS TO MATCH EXISTING ROADWAY GRADES.

11. EXISTING FRENCH DRAIN PIPE INVERTS ARE FROM AMOCO DRAWINGS. CONTRACTOR SHALL FIELD VERIFY PIPE ELEVATIONS BEFORE PRECASTING SUMP. EXISTING FRENCH DRAIN PIPES WEST OF NEW SUMP DO NOT NEED TO BE CONNECTED TO NEW SUMP.

12. IF WEATHER DOES NOT ALLOW FOR THE CONSTRUCTION OF THE PERMANENT ASPHALT ROADWAY, THE CONTRACTOR SHALL INSTALL A TEMPORARY ROADWAY UNTIL SUCH TIME THAT THE PERMANENT ROADWAY CAN BE CONSTRUCTED. THE TEMPORARY ROADWAY SHALL BE CONSTRUCTED USING 6 IN. OF CRUSHED STONE. STONE SHALL BE IN CONFORMANCE WITH COARSE AGGREGATE SIZE NO. 2 AS DEFINED IN IDOH STANDARD NO. [illegible]. THE CRUSHED STONE SHALL BE COMPACTED WITH A MINIMUM OF 4 PASSES USING A 10 TON SMOOTH DRUM VIBRATORY ROLLER OR AS APPROVED BY AMOCO.

13. PRECAST MANHOLE COMPONENTS SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM C478 EXCEPT AS AMENDED BY THESE SPECIFICATIONS.

14. CONCRETE FOR PRECAST SECTIONS AND BASE SHALL HAVE A MINIMUM ULTIMATE 28-DAY COMPRESSIVE STRENGTH OF 4000 PSI (27MPa).

15. JOINTS OF THE MANHOLE SECTIONS SHALL BE FORMED ENTIRELY OF CONCRETE EMPLOYING A ROUND NEOPRENE GASKET IN ACCORDANCE WITH ASTM C443. THE NEOPRENE GASKET SHALL BE SELF-CENTERING IN A GASKET GROOVE CAST IN THE SPIGOT RING AND SHALL BE WATERTIGHT UPON COMPRESSION BY THE MANHOLE SECTIONS.

16. EACH SECTION OF THE PRECAST MANHOLE SHALL HAVE NOT MORE THAN TWO HOLES FOR THE PURPOSE OF HANDLING AND SETTING. THESE HOLES SHALL BE TAPERED AND SHALL BE PLUGGED WITH MORTAR AFTER INSTALLATION.

17. THE PRECAST BASE SECTION SHALL BE INSTALLED ON A FIRM STABILIZED COMPACTED FOUNDATION PREPARED SIMILAR TO THOSE REQUIRED FOR THE PROPER INSTALLATION OF THE ADJACENT PIPELINES.

18. REQUISITION AND MANHOLE NUMBERS, TOP SURFACE, DATE OF FABRICATION AND APPROXIMATE WEIGHT OF EACH SECTION SHALL BE CLEARLY MARKED BY VENDOR WITH PAINT ON ALL SECTIONS FURNISHED.

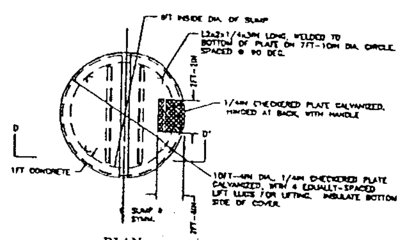
19. DURING CURING, FORM REMOVAL, STORAGE, TRANSPORATION, AND ERECTION, PRECAST MEMBERS SHALL NOT BE OVERSTRESSED, WARPED OR OTHERWISE DAMAGED.

20. PRECAST MEMBERS SHALL BE ADEQUATELY BRACED AND SUPPORTED DURING ERECTION TO INSURE PROPER ALIGNMENT AND STRUCTURAL INTEGRITY.

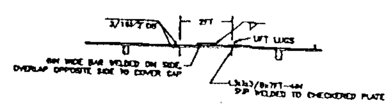
21. ALL STEEL REINFORCEMENT IN CONCRETE SHALL BE 1 1/2 IN. CLEAR OF INSIDE SURFACE.

22. ALL STEEL ASTM A36, GALVINIZED. SEE AMOCO SPECIFICATION B2C-15 FOR APPLICABLE SPECIFICATIONS.

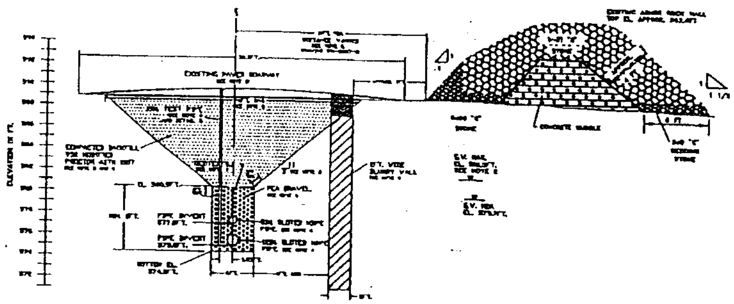
23. STANDARD C.I. SHAFT STEPS 12 IN. WIDE SUCH AS NEENAH R-1981-N OR APPROVED EQUIVALENT. STEPS SHALL BE ORIENTED FOR EASY ACCESS TO PUMPS AND CONTINUE THROUGH REMOVABLE GRATING AND SHALL STOP WITHIN A MINIMUM OF TWO FEET FROM THE BOTTOM OF THE SUMP.



PLAN
SUMP COVER DESIGN
DETAIL D
NOT TO SCALE



SECTION OF SUMP COVER DESIGN
SECTION D-D'
NOT TO SCALE



TYPICAL FRENCH DRAIN CROSS SECTION
SECTION A-A'
NOT TO SCALE

No.	Revision	Date	By	App.
2	AMOCO DRAWING NUMBER	12/30/92		
1	AS-BUILT DETAILS, COVER DESIGN, SUMP NOTES, AND REMOVED NOTE 5 AND RENUMBER	4/??/92		
	ISSUE FOR CONSTRUCTION	11/20/91	DGB	FVJ
0	ISSUE FOR BID	10/7/91	DGB	FVJ

AMOCO OIL COMPANY
WHITING REFINERY

LAKEFRONT GROUNDWATER INVESTIGATION
PROJECT 5W-2337 RA NO. 13015-11

WEST FRENCH DRAIN SYSTEM
SECTIONS AND DETAILS

DGB	JM	FVJ	FVJ
SEPT 91	84C3114-1218	291-2337-32	

Woodward-Clyde Consultants

D-3016-S-1082

1.2.2 Lakefront Recovery Well LFRW-1

System Type. Large diameter recovery well, two sump system.

System Purpose and Objective. The purpose of this system is to establish inward hydraulic gradient control and recover FPH. The objective is to prevent FPH from reaching Lake Michigan.

System Pumping Rate. Groundwater modeling indicates that hydraulic gradient control can be obtained at 3.5 gpm pumping rates in conjunction with the Standard Avenue French Drain system operations. A groundwater divide will be monitored from field measurements after the installation of the Standard Avenue french drain is installed.

System Duration. Long term, as long as FPH is present in the monitoring wells near the system. Use MW 201A as reference point.

Brief System Description. The system was operational in March 1994 and was designed to create an inward groundwater gradient condition within the lakefront property after the completion of the physical barrier system around the Lake Michigan shoreline portion of the property.

System Mechanics. The system contains one WMRS model no. 4008-02-FX2 combination explosion proof electric and pneumatic FPH only piston pump and one Grundfos electric submersible rediflo pump model #10E5 with 460 volt, 3 phase, 0.33 HP motor.

- drilled to a nominal diameter of 24 inches;
- drilled to a final depth of 28 feet;
- a screened interval of 8 feet to 20 feet;
- a basal sump of 5 feet (20 to 25 foot depth);
- well screen and riser pipe 12 inch I.D. comprising 316 stainless steel, wirewound, and having a number 6 slot well screen size;
- a sand filter pack of Colorado silica #32 through #40;
- a top seal comprising a 2 foot cement bentonite grout; and
- a 4x6x3 foot deep manhole vault with manhole cover.

O&M. An O&M procedure has been prepared by Woodward-Clyde Consultants.

Plot Plan. Lakefront property site hydraulic control and recovery well location, Woodward-Clyde Consultants, Figure No. 1, 11/22/93, 88C3114-2010.

Performance Evaluations. A well pumping yield test was performed 6/94 by Woodward-Clyde Consultants.

System Dependencies. This system was designed to run in tandem with the Buffalo Side French Drain system, and the installation of the slurry wall along the south east side of the lakefront property.

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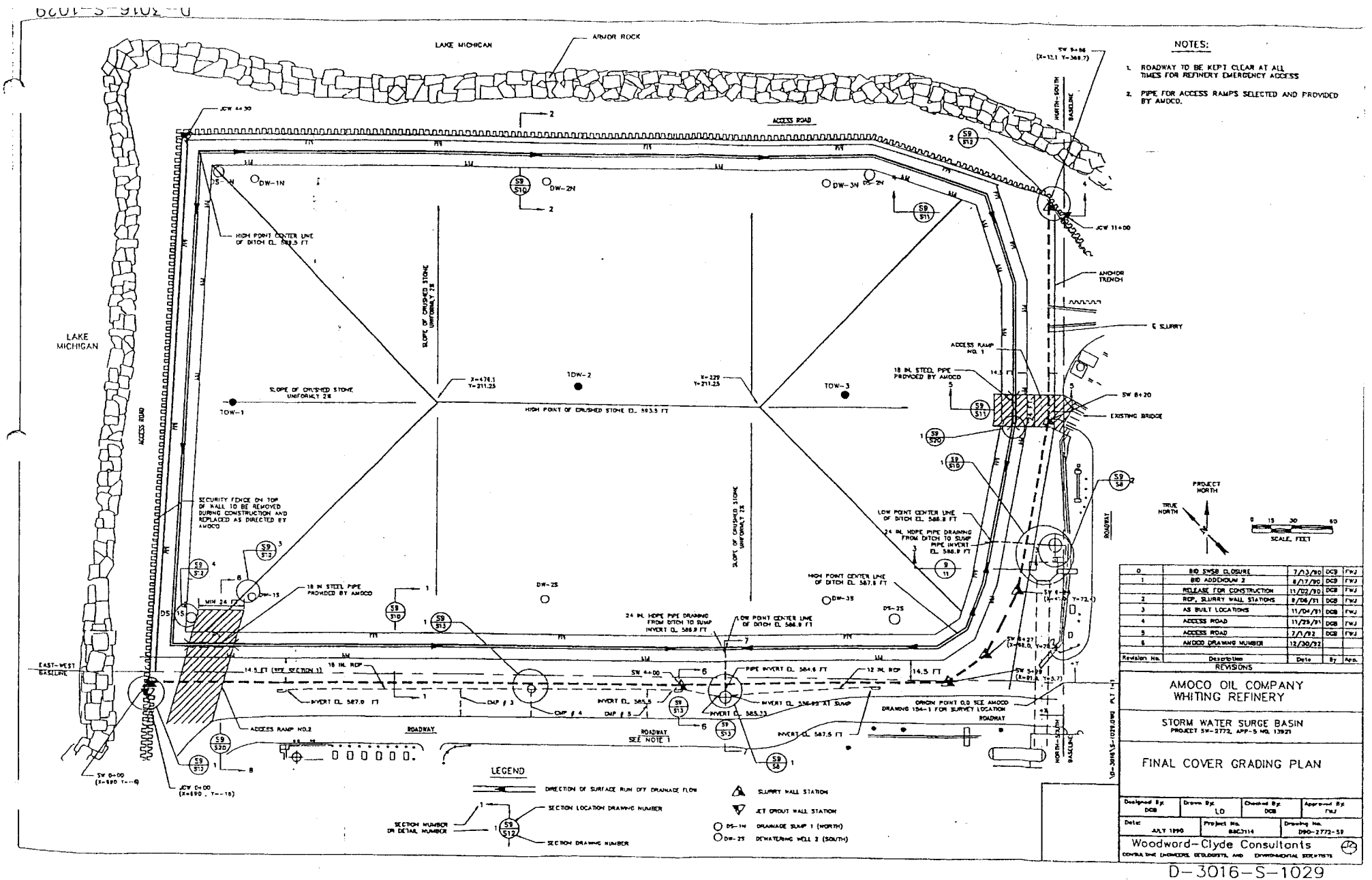
Server response: 200(HTTP_OK)
OK

Please make sure this file can be accessed by typing it into your browsers address bar then pressing enter.

If the file exists then the browser will prompt you to download it.Cancel the prompt and report this problem to your Website Administrator.

If the file does not exist then the browser will provide you with an error message that may help further.



Revision No.	Description	Date	By	App.
0	BID SWSB CLOSURE	7/13/90	DCB	FWJ
1	BID ADDENDUM 2	8/17/90	DCB	FWJ
	RELEASE FOR CONSTRUCTION	11/02/90	DCB	FWJ
2	ROP, SLURRY WALL STATIONS	8/06/91	DCB	FWJ
3	AS BUILT LOCATIONS	11/04/91	DCB	FWJ
4	ACCESS ROAD	11/25/91	DCB	FWJ
5	ACCESS ROAD	2/1/92	DCB	FWJ
6	AMOCO DRAWING NUMBER	12/30/92		

REVISIONS

AMOCO OIL COMPANY
WHITING REFINERY

STORM WATER SURGE BASIN
PROJECT SW-2772, APP-5 NO. 13921

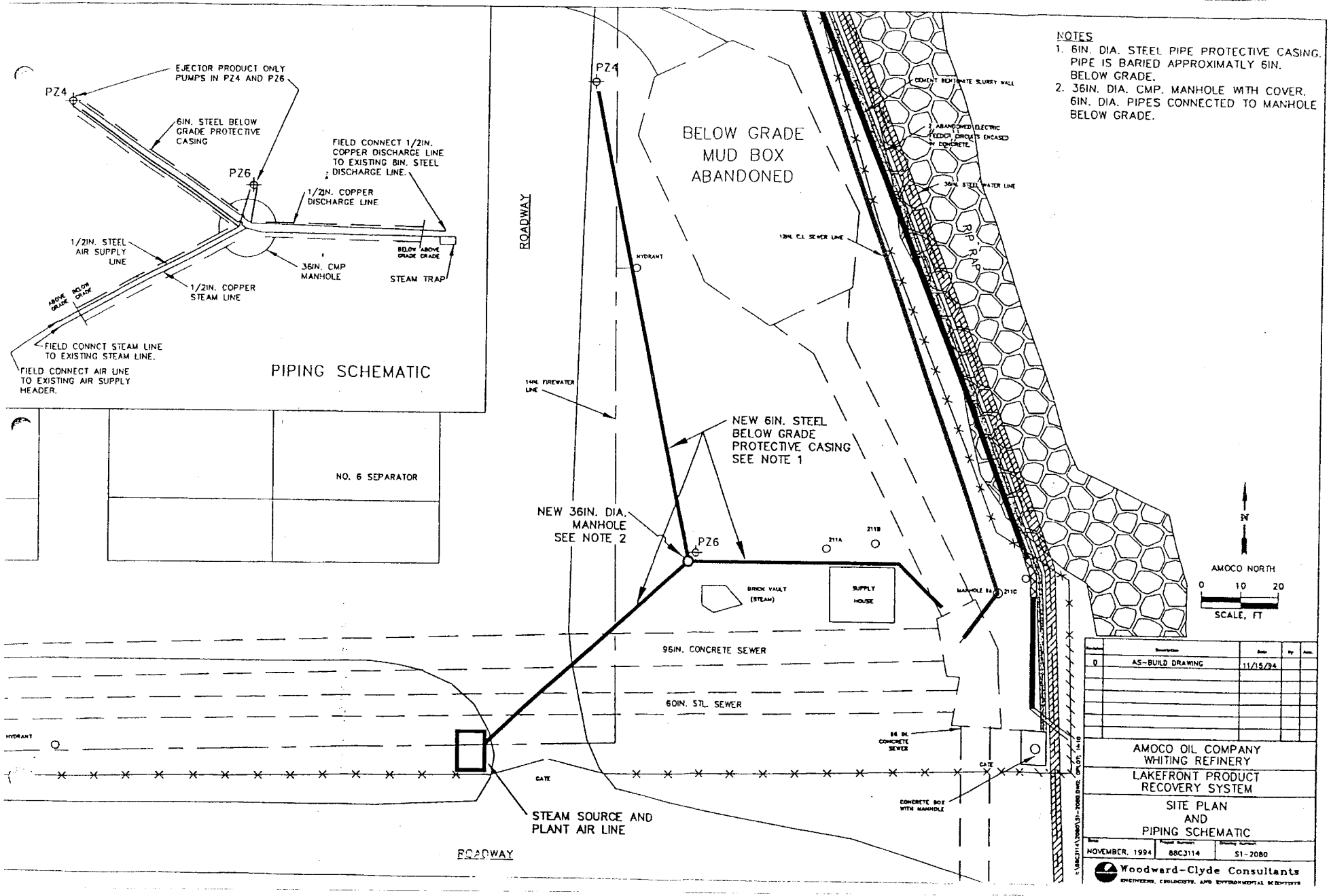
FINAL COVER GRADING PLAN

Designed By	Drawn By	Checked By	Approved By
DCB	LO	DCB	FWJ

Date	Project No.	Drawing No.
JULY 1990	88C3114	D90-2772-59

Woodward-Clyde Consultants
CONSULTING ENGINEERS, GEOLOGISTS, AND ENVIRONMENTAL SCIENTISTS

D-3016-S-1029


EJECTOR PRODUCT ONLY PUMPS IN PZ4 AND PZ6
PZ4
6IN. STEEL BELOW GRADE PROTECTIVE CASING
PZ6
FIELD CONNECT 1/2IN. COPPER DISCHARGE LINE TO EXISTING 8IN. STEEL DISCHARGE LINE.
1/2IN. COPPER DISCHARGE LINE
1/2IN. STEEL AIR SUPPLY LINE
36IN. CMP MANHOLE
STEAM TRAP
1/2IN. COPPER STEAM LINE
FIELD CONNCT STEAM LINE TO EXISTING STEAM LINE.
FIELD CONNECT AIR LINE TO EXISTING AIR SUPPLY HEADER.
PIPING SCHEMATIC
NOTES
1. 6IN. DIA. STEEL PIPE PROTECTIVE CASING. PIPE IS BARIED APPROXIMATLY 6IN. BELOW GRADE.
2. 36IN. DIA. CMP. MANHOLE WITH COVER. 6IN. DIA. PIPES CONNECTED TO MANHOLE BELOW GRADE.
BELOW GRADE MUD BOX ABANDONED
ROADWAY
HYDRANT
14IN. FIREWATER LINE
NEW 6IN. STEEL BELOW GRADE PROTECTIVE CASING SEE NOTE 1
NEW 36IN. DIA. MANHOLE SEE NOTE 2
NO. 6 SEPARATOR
BRICK VAULT (STEAM)
SUPPLY HOUSE
96IN. CONCRETE SEWER
60IN. STL. SEWER
GATE
STEAM SOURCE AND PLANT AIR LINE
ROADWAY
CEMENT BENTONITE SLURRY WALL
ABANDONED ELECTRIC FEEDER CIRCUITS ENCASED IN CONCRETE
36IN. STEEL WATER LINE
12IN. C.I. SEWER LINE
RIP RAP
211A
211B
211C
MANHOLE 84
86 IN. CONCRETE SEWER
CONCRETE BOX WITH MANHOLE
AMOCO NORTH
0 10 20
SCALE, FT
0 AS-BUILD DRAWING 11/15/94
AMOCO OIL COMPANY
WHITING REFINERY
LAKEFRONT PRODUCT RECOVERY SYSTEM
SITE PLAN AND PIPING SCHEMATIC
NOVEMBER, 1994
88C3114
S1-2080
Woodward-Clyde Consultants

1.2.4 Temporary Wellpoint System (Lakefront)

System Type. Wellpoint system.

System Purpose and Objective. The purpose of this system is to establish interim hydraulic gradient control at the southeast section of the Whiting Refinery Lakefront property. The objective is to prevent FPH from reaching Lake Michigan.

System Pumping Rate. 50-100 gpm.

System Duration. The system was placed in operation shortly after the installation of the slurry wall to the southeast of Amoco's lakefront property. The temporary wellpoint system will be replaced by two 4 inch total fluid recovery wells to be pumped by pneumatic Ejector pumps and the Standard Avenue french drain.

Brief System Description. FPH was floating atop the surface water to the south east of the Whiting Refinery lakefront property. The temporary wellpoint system was installed to provide an inward groundwater gradient away from the lake.

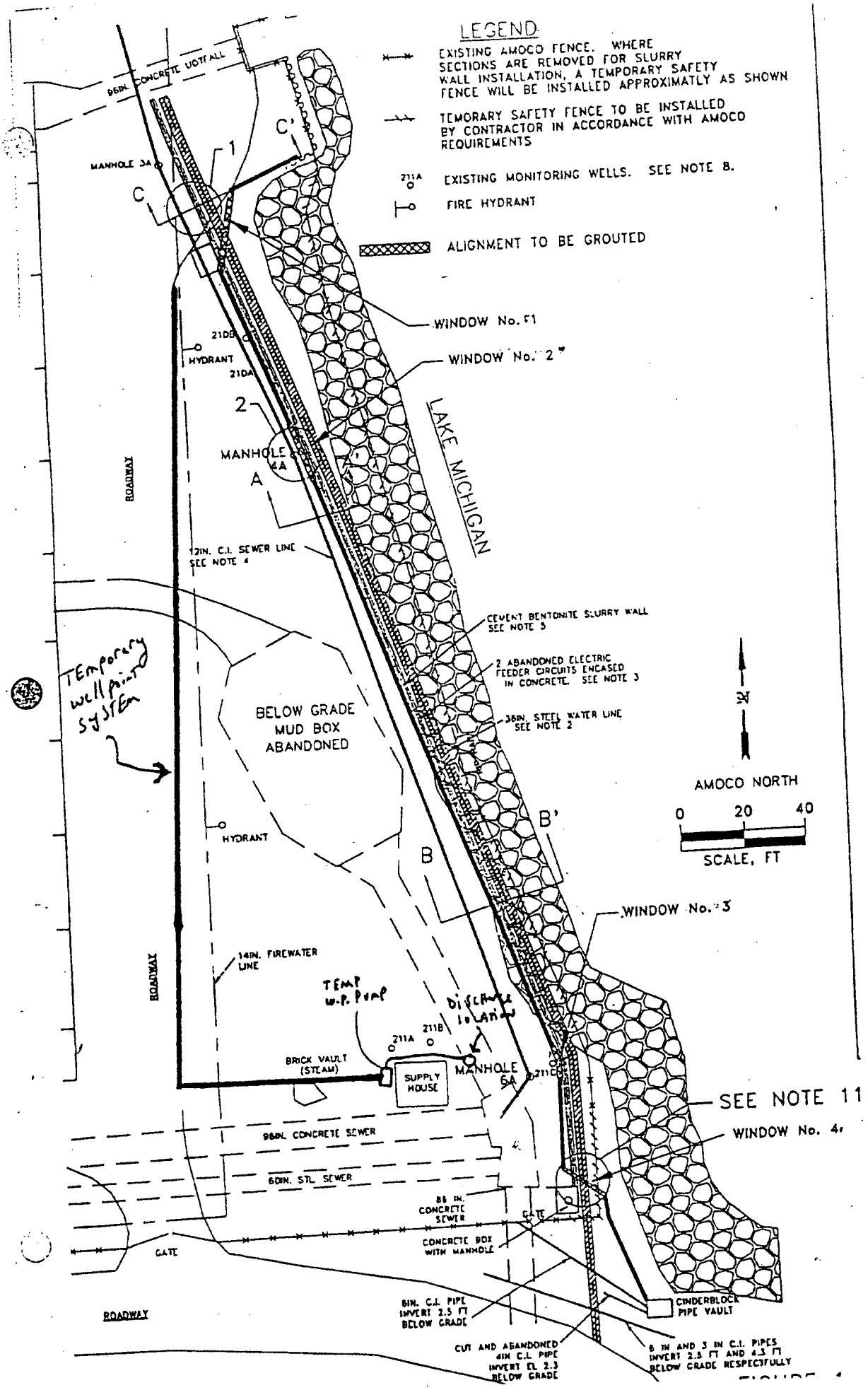
System Mechanics. Electrical wellpoint system, 30 wellpoints 15 feet deep.

O&M. Griffin Dewatering is currently maintaining the system for operation. The lakefront maintenance oversees systems operation.

Plot Plan. None available. (Hand drawn location attached.)

Performance Evaluations. Not applicable.

System Dependencies. This system is dependent on the installation of the slurry wall to the southeast of the lakefront property.


LEGEND
EXISTING AMOCO FENCE. WHERE SECTIONS ARE REMOVED FOR SLURRY WALL INSTALLATION, A TEMPORARY SAFETY FENCE WILL BE INSTALLED APPROXIMATLY AS SHOWN
TEMORARY SAFETY FENCE TO BE INSTALLED BY CONTRACTOR IN ACCORDANCE WITH AMOCO REQUIREMENTS
211A EXISTING MONITORING WELLS. SEE NOTE 8.
FIRE HYDRANT
ALIGNMENT TO BE GROUTED
96IN. CONCRETE OUTFALL
MANHOLE 3A
WINDOW No. 1
WINDOW No. 2
211B
HYDRANT
211A
MANHOLE 4A
ROADWAY
LAKE MICHIGAN
12IN. C.I. SEWER LINE SEE NOTE 4
CEMENT BENTONITE SLURRY WALL SEE NOTE 5
2 ABANDONED ELECTRIC FEEDER CIRCUITS ENCASED IN CONCRETE. SEE NOTE 3
36IN. STEEL WATER LINE SEE NOTE 2
Temporary well point system
BELOW GRADE MUD BOX ABANDONED
AMOCO NORTH
0 20 40
SCALE, FT
WINDOW No. 3
14IN. FIREWATER LINE
TEMP W.P. PUMP
DISCHARGE TO LAKE
BRICK VAULT (STEAM)
SUPPLY HOUSE
MANHOLE 6A
SEE NOTE 11
WINDOW No. 4
96IN. CONCRETE SEWER
60IN. STL SEWER
86 IN. CONCRETE SEWER
GATE
CONCRETE BOX WITH MANHOLE
CINDERBLOCK PIPE VAULT
6IN. C.I. PIPE INVERT 2.5 FT BELOW GRADE
CUT AND ABANDONED 4IN C.I. PIPE INVERT EL 2.3 BELOW GRADE
6 IN AND 3 IN C.I. PIPES INVERT 2.5 FT AND 4.3 FT BELOW GRADE RESPECTFULLY

1.2.5 Lakefront Temporary Wellpoint System FPH Recovery Replacement

System Type. Recovery well (2-4 inch diameter)

System Purpose and Objective. The purpose of this system is to remove FPH located at the southeast corner of the lakefront property. A slurry wall was installed in January 1994 to prevent FPH from reaching Lake Michigan near this location. This system was installed to remove the FPH that collects inthe groundwater trough created by the lakefront temporary wellpoint system.

System Pumping Rate. 2-4 gpm.

System Duration. As long as FPH is monitored at this location.

Brief System Description. The system is comprised of two pneumatic Ejector pumps and associated discharge piping.

System Mechanics. Ejector pneumatic pumps, 4 inch diameter, 20 feet deep wells.

O&M. None available.

Plot Plan. Woodward-Clyde Consultants, Drawing No. S1-2080, 11/94, 88C3114.

Performance Evaluations. Quarterly fluid levels taken to monitor groundwater gradient and FPH thickness and sentinel well monitoring program. The sentinel well monitoring program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. None.

1.3 TANK FIELD SYSTEMS

1.3.1 South Tank Field J-160

System Type. Wellpoint system, single pump.

System Purpose and Objective. The purpose of this system is to establish hydraulic gradient control. The objective is to prevent FPH from flowing beneath Indianapolis Boulevard and to prevent oil from intercepting the Indianapolis Boulevard stormwater sewer system. The objective is also to contain FPH to Refinery property and to recover FPH from the South Tank Field plume.

System Pumping Rate. Average 75 gpm.

System Duration. As long as necessary to contain FPH to Amoco property and effective recovery of FPH from the South Tank Field plume.

Brief System Description. The J-160 wellpoint system was installed in 1968-1970 to provide a hydraulic gradient control within Amoco Whiting Refinery property boundary.

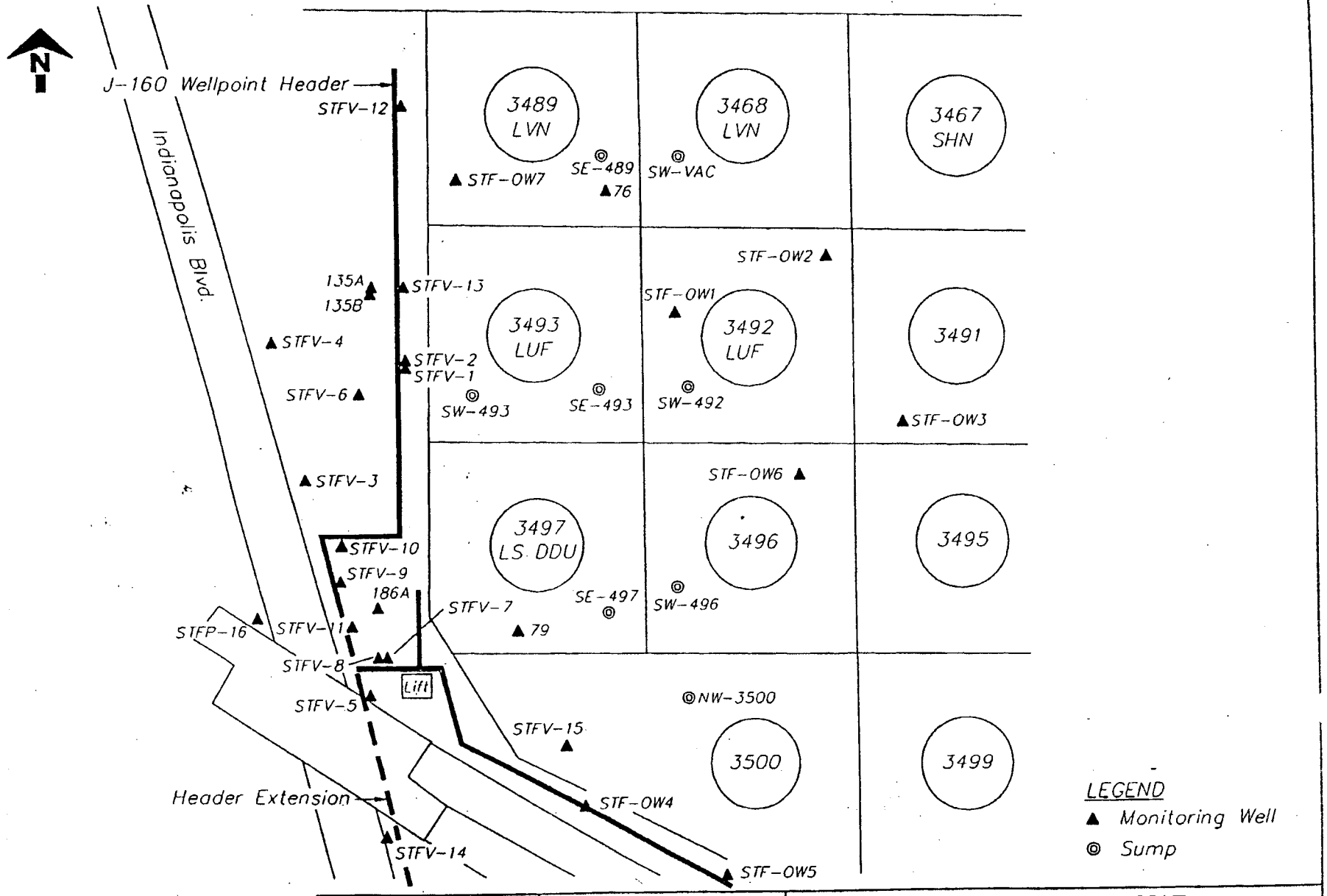
System Mechanics. The wellpoint system is 1,455 feet long. The original J-160 system contained 139 wellpoints. The modified system will contain 2,055 feet of wellpoint header pipe and 189 wellpoints and 26 vacuum recovery devices.

O&M. The current O&M is performed by the Refinery Environmental Inspector.

Plot Plan. J-160 Investigation South Tank Field, Figure No. 1, March 17, 1995, Bascor Environmental, Inc.

Performance Evaluations. Quarterly fluid levels taken to monitor groundwater gradient and FPH thickness and sentinel well monitoring program. The sentinel well monitoring program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. This system may be affected by the installation of additional large diameter recovery wells within the South Tank Field plume. At this time the J-160 wellpoint system will be evaluated for hydraulic gradient control effectiveness in conjunction with the installation of the future additional recovery wells.


N
J-160 Wellpoint Header
STFV-12
Indianapolis Blvd.
3489 LVN
3468 LVN
3467 SHN
STF-OW7
SE-489
76
SW-VAC
STF-OW2
135A
135B
STFV-13
STF-OW1
3493 LUF
3492 LUF
3491
STFV-4
STFV-2
STFV-1
STFV-6
SW-493
SE-493
SW-492
STF-OW3
STFV-3
STF-OW6
3497 LS DDU
3496
3495
STFV-10
STFV-9
186A
SE-497
SW-496
STFV-7
79
STFP-16
STFV-11
STFV-8
Lift
NW-3500
STFV-5
STFV-15
3500
3499
Header Extension
STF-OW4
STFV-14
STF-OW5
0 75 150
SCALE: 1"=60'
AMOCO
BASCOR Environmental, Inc.
consulting en and scientists
WELL LOCATION MAP
J-160 INVESTIGATION
SOUTH TANK FIELD
DRAWN S.WHITNEY
CHECKED R.SENN
APPROVED S.SENN
DATE 3-17-95
FILENAME: D:\DWGS\A094064\J160WELL.DWG
REFERENCE FILES: NONE
URE 1
LEGEND
Monitoring Well
Sump

1.3.3 South Tank Field Recovery Sumps 3493 Tank Dike

System Type. 36 inch diameter shallow sumps.

System Purpose and Objective. The purpose of this system is to recover FPH by utilizing existing shallow sumps used in some tank dikes as part of the dike area surface water removal system. The objective is to remove a Light Ultraformate petroleum product from the 3493 tank dike area and to prevent FPH from migrating away from the tank dikes.

System Pumping Rate. Two pneumatic ejector pumps were installed in two shallow sumps inside tank dike 3493. Pumping rates are 15 gpm each sump.

System Duration. The pumps were installed March 1994 when FPH was indicated floating in the existing sumps.

Brief System Description. The sumps were already installed by Oil Movement Division as part of their normal operating procedure for the surface water removal inside the tank dike. Remediation Services Division utilized the existing sumps as FPH recovery sumps. This system will be replaced by large diameter recovery wells in January 1995.

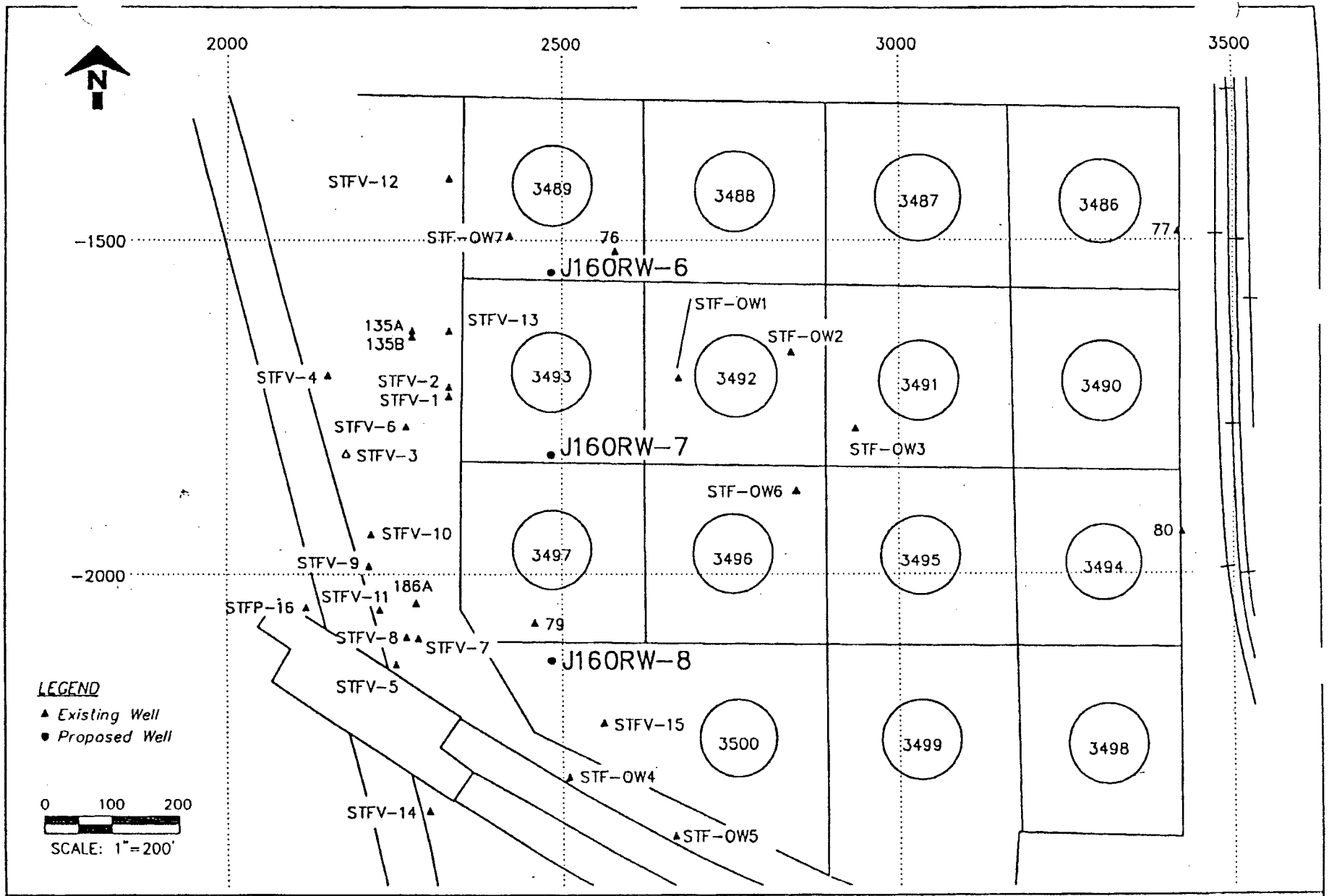
System Mechanics. Ejector pneumatic pumps high capacity flow of 10-20 gpm. A pump controller is used to regulate the flow of groundwater to be pumped. Discharges into the South Tank Field water draw system.

O&M. No O&M manual is prepared due to its temporary function.

Plot Plan. Figure 1.

Performance Evaluations. Quarterly fluid levels taken to monitor groundwater gradient and FPH thickness and sentinel well monitoring program. The sentinel well monitoring program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. This system is dependent on the availability of plant compressor air. Systems expected to be replaced by new recovery wells.



BASCOR Environmental, Inc.
consulting engineers and scientists

AMOCO WHITING REFINERY
SOUTH TANK FIELD

PROPOSED RECOVERY WELL LOCATIONS

DRAWN	CHECKED	APPROVED	DATE
S.WHITNEY	R.SENN		11-29-94
FILENAME: D:\DWGS\A094088\STFRWELL.DWG		REFERENCE FILES: NONE	FIGURE 1

1.3.4 South Tank Field Annex J-156 and J-157, Installed by the Refinery

System Type. Wellpoint system.

System Purpose and Objective. The purpose of this system is to establish hydraulic control. The objective is to contain FPH to Amoco property.

System Pumping Rate. J-156 is approximately 50 gpm and J-157 is approximately 60 gpm.

System Duration. These systems will operate as long as FPH is present at this location.

Brief System Description. The wellpoint system was installed in 1968-1970 to provide a hydraulic gradient control along Amoco Whiting Refinery property boundary.

System Mechanics. The J-156 wellpoint system is 1,660 feet long. The system contains 114 wellpoints at 15 feet deep. The J-157 wellpoint system is 2,790 feet long. The system contains 234 wellpoints at 15 feet deep.

O&M. The current O&M is performed by the Refinery Environmental Inspectors.

Plot Plan. (See Remediation Systems Map.)

Performance Evaluations. Quarterly fluid levels taken to monitor groundwater gradient and FPH thickness and sentinel well monitoring program. The sentinel well monitoring program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. None.

1.3.5 Stieglitz Park Tank Field (SPTF) J-137

System Type. Wellpoint system and vacuum recovery devices.

System Purpose and Objective. The purpose of this system is to establish hydraulic gradient control and recover FPH. The objective is to contain FPH to Amoco's property and create an inward groundwater gradient to the SPTF area and also create an east/west gradient at 129th Street.

System Pumping Rate. 100-150 gpm average range.

System Duration. As long as FPH is present in SPTF area.

Brief System Description. The SPTF J-137 wellpoint system was installed to prevent FPH from leaving the Whiting Refinery and containing any FPH present in SPTF onsite. The system was installed in April 1993. In June 1993, 24 vacuum recovery devices were added to the system to recover FPH that is drawn in by the wellpoint system. The FPH is then directly discharged into the NESHAP benzene pipe.

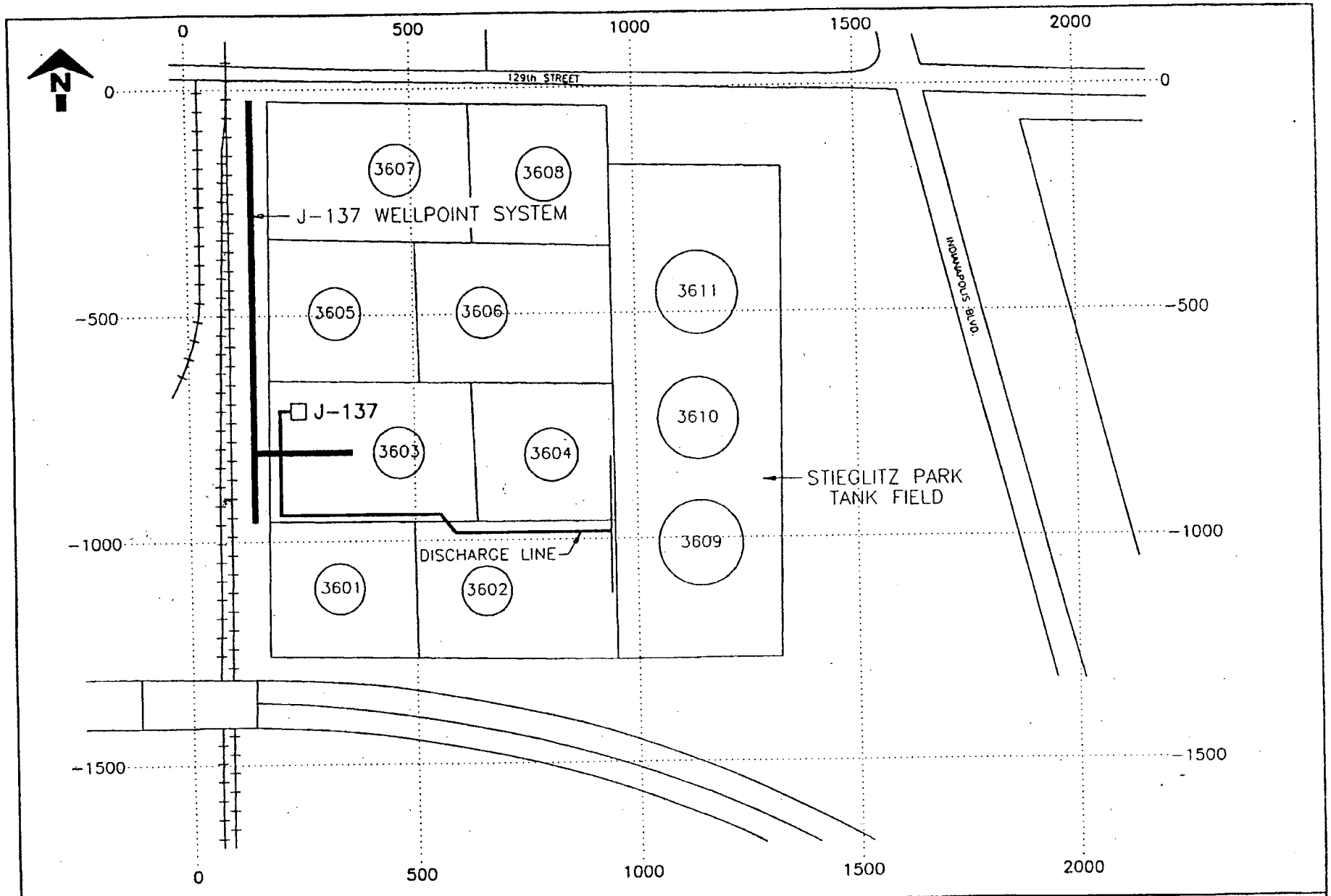
System Mechanics. The wellpoint pump is a 30 HP vacuum centrifugal oil cooled pump. The system contains 1,000 feet of wellpoint vacuum header pipe, with 99 active wellpoints operational and 24 vacuum recovery devices running in tandem with this system.

O&M. An O&M manual will be prepared for this project.

Plot Plan. Bascor Environmental, Inc. Drawing No. (currently not assigned).

Performance Evaluations. Quarterly fluid levels taken to monitor groundwater gradient and FPH thickness and sentinel well monitoring program. The sentinel well monitoring program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. This system is balanced with J-139 to maintain groundwater gradient control along the south leg of J-139.



0 150 300

SCALE: 1"=300'

AMOCO

BASCOR Environmental, Inc.
consulting engin nd scientists

AMOCO WHITING REFINERY

STIEGLITZ PARK TANK FIELD
J-137 WELLPOINT SYSTEM

DRAWN	CHECKED	APPROVED	DATE
S.WHITNEY	R.SENN	S.SENN	22-95

FILENAME: D:\DWGS\A094064\STIGWP.DWG

REFERENCE FILES: NONE

FIGURE 1

1.3.6 Indiana Tank Field J-138A&B

System Type. Wellpoint system and vacuum recovery devices.

System Purpose and Objective. The purpose of this system is to establish hydraulic gradient control and recover FPH. The objective is to prevent FPH from migrating off Amoco's property.

System Pumping Rate. The system is pumping an average of 100-200 gpm range.

System Duration. The system will pump as long as hydraulic gradient control is needed for this general area.

Brief System Description. The wellpoint system was installed in 1991 to provide hydraulic gradient control back inward toward Amoco property. The wellpoint system was designed to pump at a deeper depth of 21 feet, than the J-139 system pumping at 15 feet deep. After obtaining a hydraulic gradient back onto Amoco's property, vacuum recovery devices were installed in 1993 to remove the FPH beneath the tank field.

System Mechanics. Standard wellpoint system, 50 HP each pump. A total of two pumps. 2,714 feet of 254 wellpoints at 21 feet deep, and 191 vacuum recovery devices for FPH recovery. The system is electrical heat traced and insulated and has 8 inch vacuum header pipes and aluminum header pipes.

O&M. An O&M manual was prepared by Bascor. The Refinery's Environmental Inspectors are responsible for O&M.

Plot Plan. (See Remediation Systems Map.)

Performance Evaluations. Quarterly fluid levels taken to monitor groundwater gradient and FPH thickness and sentinel well monitoring program. The sentinel well monitoring program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. This system is currently not dependent on any other system. Although the system is running in tandem with the J-139 and J-140 wellpoint systems.

1.3.7 Indiana Tank Field/C-Station J-140

System Type. Wellpoint system and vacuum recovery devices.

System Purpose and Objective. The purpose of this system is to establish hydraulic gradient control. The objective is to prevent FPH from migrating off Amoco's property.

System Pumping Rate. The average pumping rate is 70 gpm.

System Duration. This system will continue to pump as long as hydraulic gradient control is needed at this location.

Brief System Description. The J-140 system was installed in 1981. The system was operational to provide a hydraulic barrier along the C-Station terminal at the Whiting Refinery. The system was modified in 1994 with the addition of 600 feet of wellpoints and 44 vacuum recovery devices to accelerate recovery of the FPH beneath this location.

System Mechanics. Standard wellpoint system (plus backup pump), 50 HP each pump, 1,370 feet of 8 inch vacuum header pipes, wellpoints at 15 feet deep and 44 vacuum recovery devices for FPH recovery. The system is electrically heat traced.

O&M. An O&M manual was prepared by Bascor Environmental. The Refinery's Environmental Inspectors are responsible for O&M.

Plot Plan. (See Remediation Systems Map.)

Performance Evaluations. Quarterly fluid levels taken to monitor groundwater gradient and FPH thickness and sentinel well monitoring program. The sentinel well monitoring program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. This system works in tandem with the J-138 and J-139 wellpoint systems but is not dependent on them.

1.4 DOCK AREA SYSTEMS

1.4.1 French Drain (Dock Area)

System Type. French drain.

System Purpose and Objective. The purpose of this system is to recover FPH at the Marina Dock. The objective is to prevent FPH from reaching Lake George Canal.

System Pumping Rate. Approximately 5-10 gpm.

System Duration. Continuous operation as needed to remove product.

Brief System Description. The french drain was installed to prevent the migration of FPH at the Refinery's Marine Dock area. FPH was identified in MW 158A and 159A. Due to underground obstructions the FPH at this location was being trapped and not able to flow back to the nearby large diameter recovery well RW-1D to the north. After installation of the french drain, no FPH was observed in wells 158A and 159A.

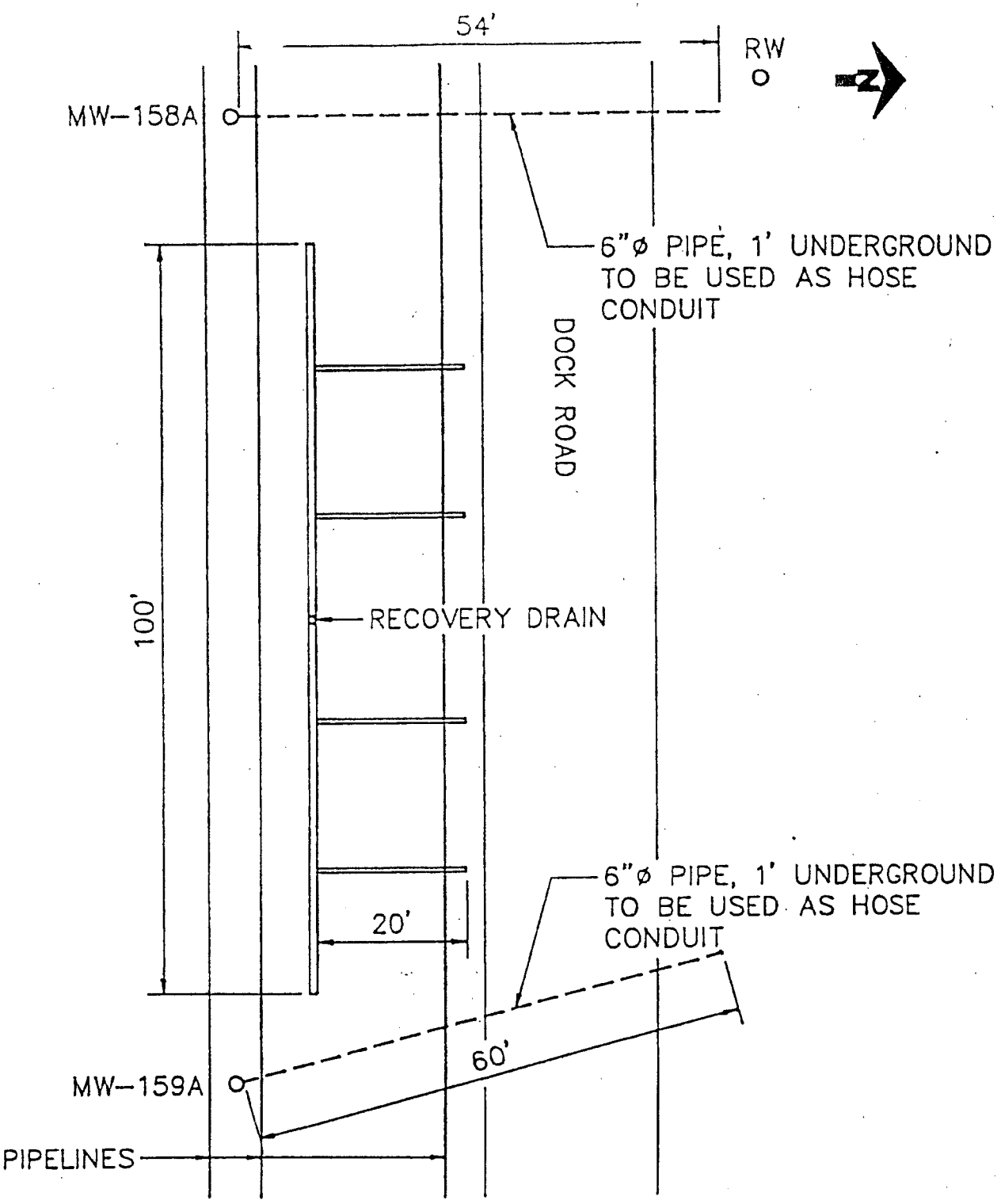
System Mechanics. The french drain was installed at two depths of 5 and 7 1/2 feet. Six inch diameter carbon steel louvered pipe was used as the collection pipe. Fine gravel was used as granular filter pack backfill material. The french drain discharges into ballast tank No. 1, and then is transported to the lakefront for treatment.

O&M. The Refinery Marine Dock area is responsible for the O&M

Plot Plan. (See attached.)

Performance Evaluations. Quarterly fluid levels obtained.

System Dependencies. This system is dependent on the RW-1D recovery well pumping in tandem with the french drain. The french drain was installed for FPH recovery only and RW-1D was intended for hydraulic gradient control.



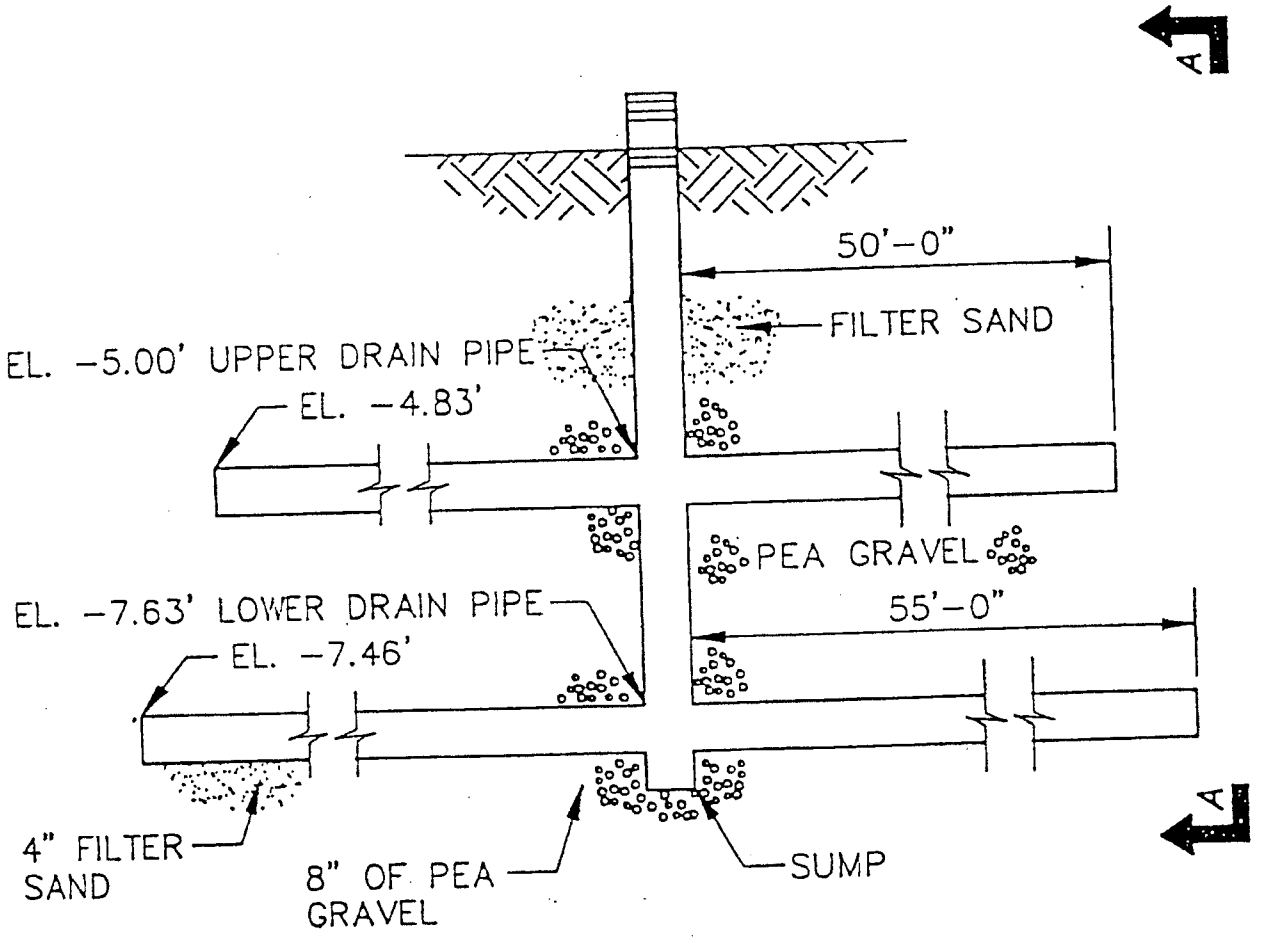
PLAN

MIDWEST DEWATERING COMPANY, INC.
1333 125th Street, P.O. Box 850
Hammond, Indiana 46325-0805
219/659-0009
FAX 219/659-0027

AMOCO OIL COMPANY

AMOCO DOCKS

SCALE N.T.S.	DATE 6/18/93	DWN BY C
		DWG. NO.



ELEVATION
SECTION

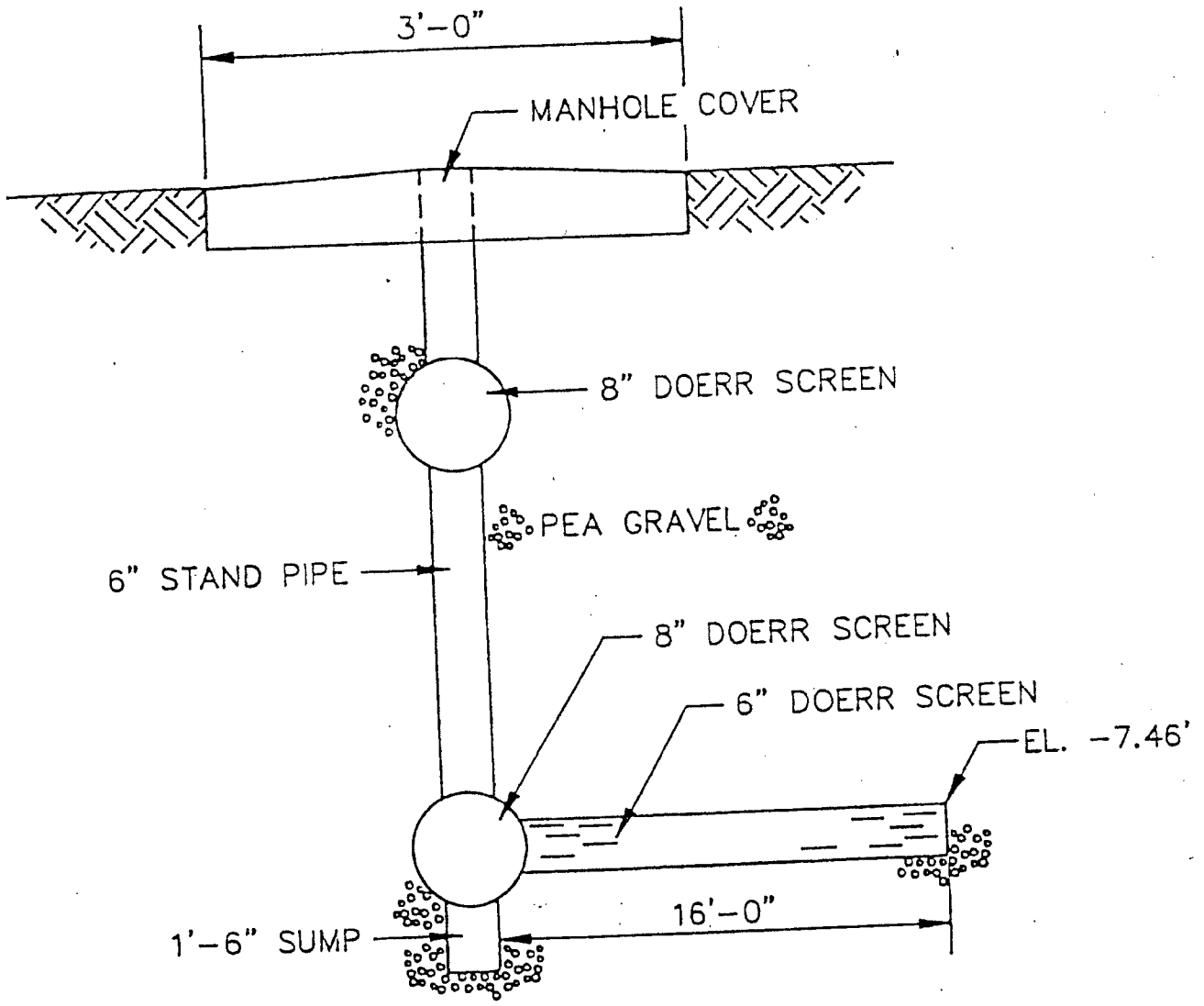
MIDWEST DEWATERING COMPANY, INC.

1333 125th Street, P.O. Box 850
Hammond, Indiana 46325-0805
219/659-0009
FAX 219/659-0027

AMOCO OIL COMPANY

FRENCH DRAIN (DOCK)

SCALE N.T.S.	DATE 8/9/93	DWN BY CF
	DWG. NO.	



SECTION A-A

MIDWEST DEWATERING COMPANY, INC.
1333 125th Street, P.O. Box 850
Hammond, Indiana 46325-0805
219/659-0009
FAX 219/659-0027

AMOCO OIL COMPANY

FRENCH DRAIN (DOCK

SCALE N.T.S.	DATE 8/9/93	DWN BY CF
	DWG. NO.	

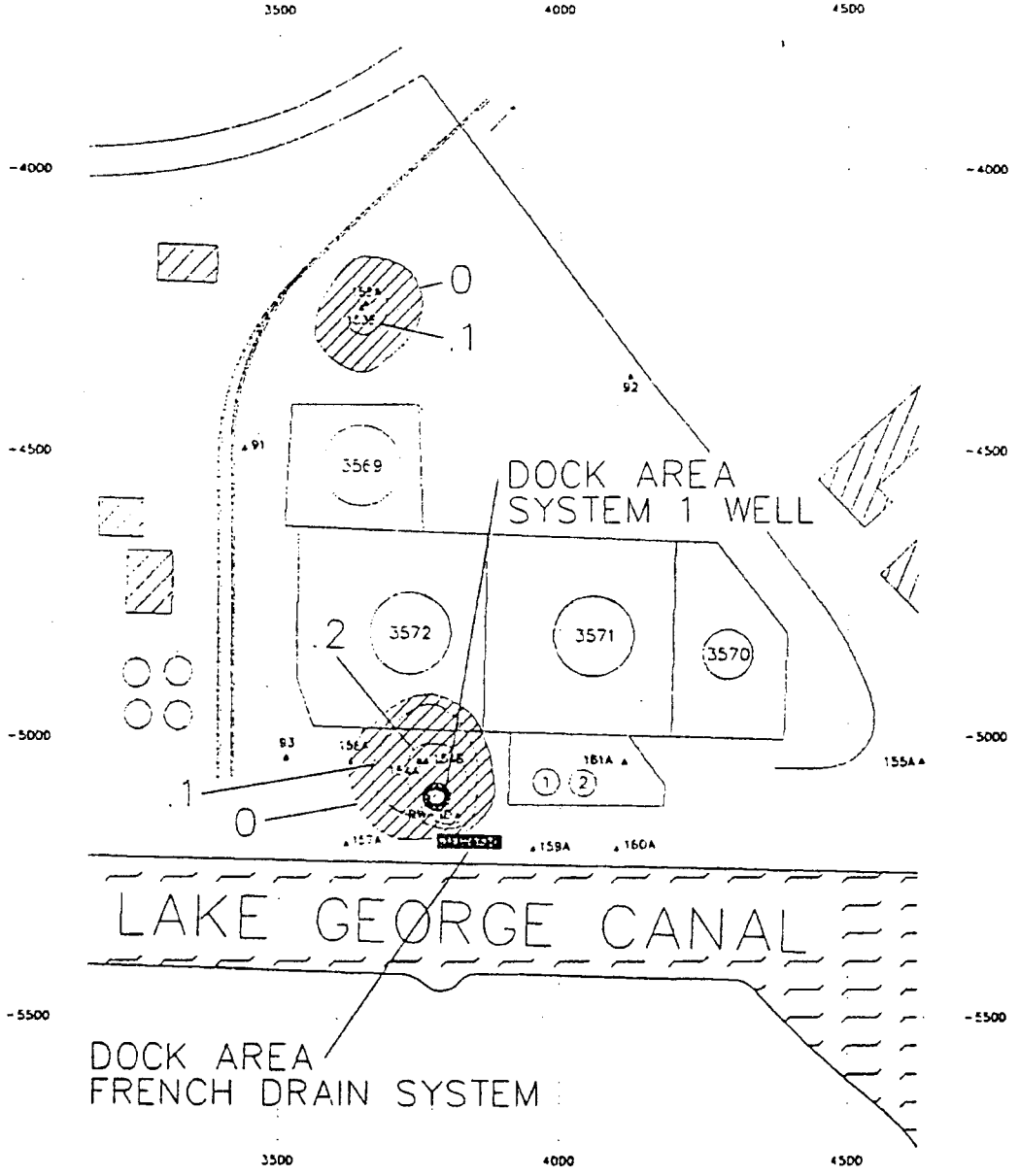


FIGURE 2

AMOCO WHITING REFINERY
DOCK AREA (AREA 7)
CORRECTED FREE PHASE HYDROCARBON
3RD QUARTER 1994

1.4.2 Recovery Well RW-1D (1-6 Inch Diameter) (Dock Area)

System Type. Large diameter recovery well.

System Purpose and Objective. The purpose of the system is to establish hydraulic gradient control and recover FPH. The objective is continuous pumping of groundwater to provide an inward gradient away from the Lake George canal sheet pile. The system discharges into the ballast tank no. 1, which is then pumped into the process sewer line.

System Pumping Rate. 10-15 gpm.

System Duration. As long as FPH is present at this location. This system was operational in 1991.

Brief System Description. The system was installed as an interim measure to provide a hydraulic gradient away from the Lake George canal. FPH was monitored near the canal.

System Mechanics. Well design and installation.

- drilled to a nominal diameter of 12 inches on 9/26/90;
- drilled to a final depth of feet 22.2, ground surface at 586.50 (feet MSL);
- a screened interval of 586 feet to 566 feet; and
- well screen and riser of 6 inch ID, 0.0020 inch slot screen, stainless steel.

O&M. The O&M for the Dock Area is performed by the Dock Area group.

Plot Plan. (See attached.)

Performance Evaluations. Quarterly fluid levels are measured in nearby monitoring wells.

System Dependencies. This system is working in tandem with the french drain system installed in 1993.

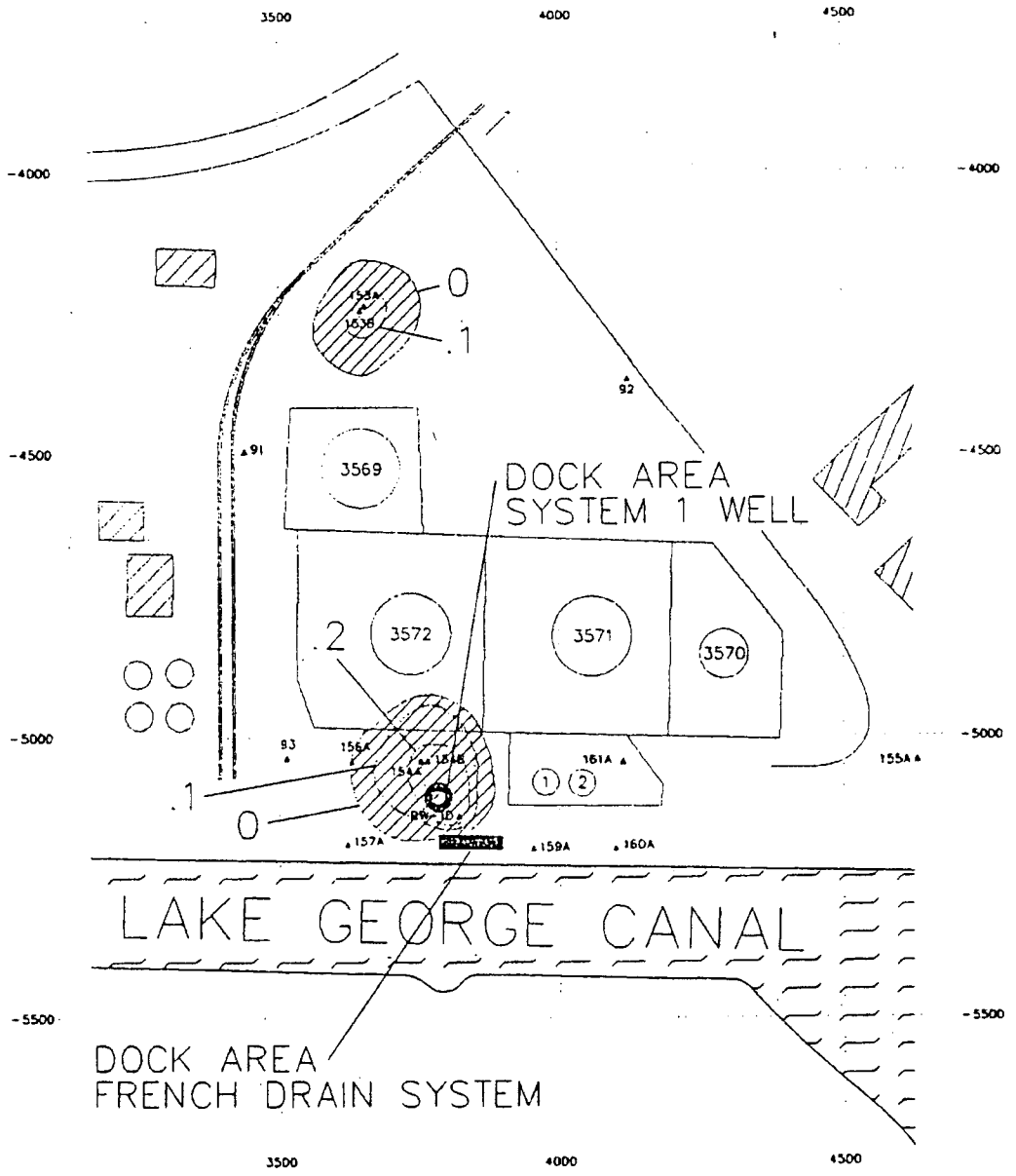


FIGURE 2

AMOCO WHITING REFINERY
DOCK AREA (AREA 7)
CORRECTED FREE PHASE HYDROCARBON
3RD QUARTER 1994

2.1 LAKE GEORGE TANK FIELD

2.1.1 129th Street Remediation

System Type. Nine large diameter recovery wells.

System Purpose and Objective. The purpose of this system is to establish hydraulic gradient control. The objective is to prevent FPH from entering the stormwater drainage ditch on the south side of 129th Street.

System Pumping Rate. The design rate is 135 gpm. The actual rate is 75 gpm.

System Duration. As long as necessary to contain FPH to Amoco property.

Brief System Description. This system was operational in 1992 and utilized large diameter recovery wells to depress the groundwater table to prevent the discharge of FPH into the stormwater drainage ditch on the south side of 129th Street which is north of the Lake George Tank Field.

System Mechanics. The system contains the following:

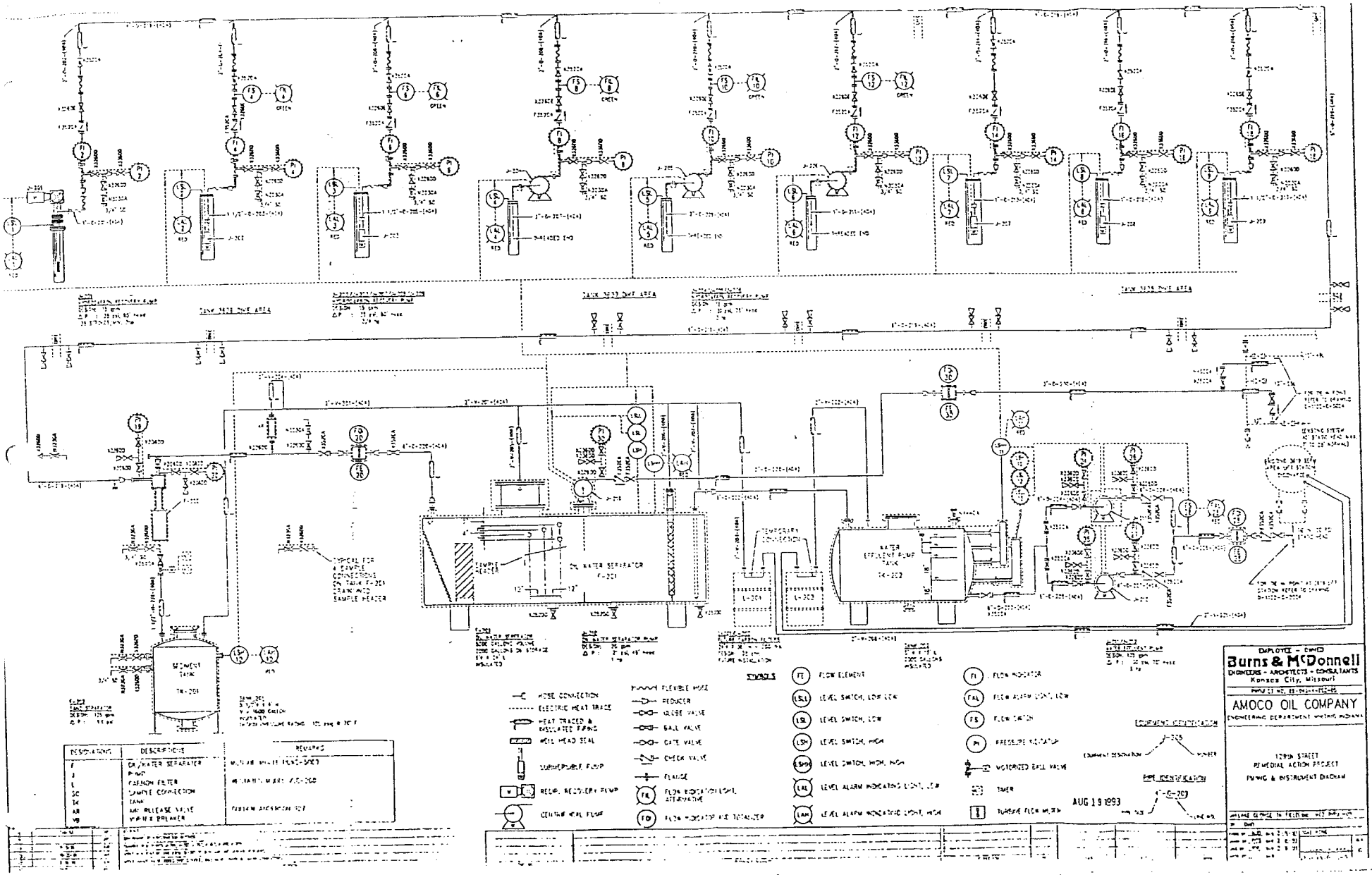
- nine 6 inch diameter recovery wells (RW-1J through RW-9J), screened approximately 3 feet below grade from 26 to 28 feet deep;
- stainless steel #304, wirewrapped, 0.002 inch slotted, with 3 foot silt trap from 28 feet to 31 feet deep;
- a #5 global sand filter pack;
- a top seal comprising a 4 foot cement bentonite grout, with a 3 foot by 3 foot concrete pad; and
- oil/water separator 5,000 gallons, sediment separator.

O&M. An O&M manual was provided to Oil Movement Division (hydrocarbon loss group). Oil Movement Division is responsible for the maintenance of this system.

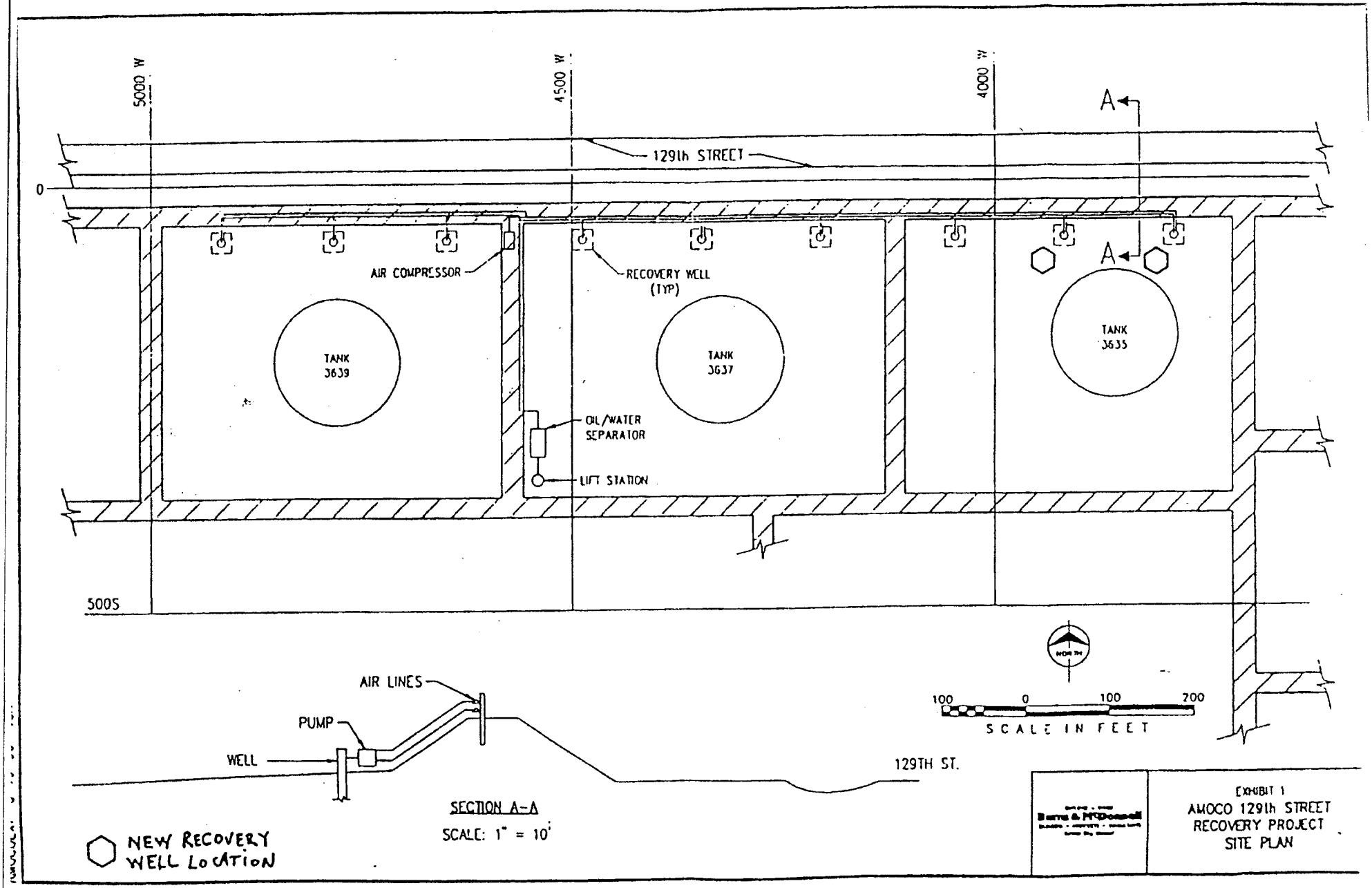
Plot Plan. D-1072-6-0169 (Rev. 2).

Performance Evaluations. Quarterly fluid levels taken to monitor groundwater gradient and FPH thickness and sentinel well monitoring program. The sentinel well monitoring program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. This system is dependent on an aboveground oil/water separator tank and effluent tank and pumps downgradient of the nine recovery wells.


OIL WATER SEPARATOR
WATER EFFLUENT PUMP TANK
SETTLEMENT TANK
TEMPORARY CONNECTION
SYMBOLS
FLOW ELEMENT
LEVEL SWITCH, LOW LOW
LEVEL SWITCH, LOW
LEVEL SWITCH, HIGH
LEVEL SWITCH, HIGH, HIGH
LEVEL ALARM INDICATING LIGHT, LOW
LEVEL ALARM INDICATING LIGHT, HIGH
FLOW INDICATOR
FLOW ALARM LIGHT, LOW
FLOW SWITCH
PRESSURE INDICATOR
MOTORIZED BALL VALVE
TIMER
TURBINE FLOW METER
HOSE CONNECTION
ELECTRIC HEAT TRACE
HEAT TRACED & INSULATED PIPING
WELL HEAD SEAL
SUBMERSIBLE PUMP
RECIRC. RECOVERY PUMP
CENTRIF. HEAT PUMP
FLEXIBLE HOSE
REDUCER
GLOBE VALVE
BALL VALVE
GATE VALVE
CHECK VALVE
FLANGE
FLOW INDICATOR LIGHT, ALTERNATIVE
FLOW INDICATOR AND TOTALIZER
EQUIPMENT IDENTIFICATION
PIPE IDENTIFICATION
AUG 19 1993
EMPLOYEE - OWNED
Burns & McDonnell
ENGINEERS - ARCHITECTS - CONSULTANTS
Kansas City, Missouri
AMOCO OIL COMPANY
ENGINEERING DEPARTMENT MERRILLVILLE, INDIANA
129th STREET
REMEDIAL ACTION PROJECT
PIPING & INSTRUMENT DIAGRAM

WHITE REFINERY
LAKE GEORGE TANK FIELD



Burns & McDonnell

EXHIBIT 1
AMOCO 129th STREET
RECOVERY PROJECT
SITE PLAN

2.1.2 Jens Lake Remediation

Remediation Type. Sludge solidification and landfill disposal.

Remediation Purpose. The purpose of this remediation is to remediate the Jens Lake one acre site due to future land ban rules and regulations enacted in 1992.

System Pumping Rate. Temporary wellpoint systems were installed to dewater the Jens Lake pond. The wellpoint system pumped at 310-400 gpm.

Remediation Duration. The remediation duration was approximately six weeks and was completed in April of 1992. Griffin remediation was selected to close the pond.

Brief Remediation Description. A small, less than one acre, man-made pond contained the surface water from the tank dikes located at the J&L site Lake George Tank Field. The water was initially pumped into an oil/water separator. The remaining water was then gravity drained into the Jens Lake pond. Remediation efforts were the following:

- dewater Jens Lake pond and concrete oil/water separator;
- use dragline and backhoe to remove the sludge and mix with fly ash;
- disposed approximately 300 cubic yards of solidified sludge to Adams Landfill, Ft. Wayne, Indiana;
- fill up the pond with dolomite/limestone and borrow material from the excavated caverns;
- steam clean and grout the oil/water separator and fill with dolomite gravel; and
- send closure information to IDEM.

Drawing Nos. Available. See photographic chronology of hydrocarbon recovery from Jens Lake and oil/water separator report dated July 1991. This report contains an executive summary and photographs for the duration of the remediation project.

File <http://vfc.idem.in.gov/FNCache/20140801174023000025/32539545_172.FOB> could not be opened.

Error: #4 File not found
(Empty file): http://vfc.idem.in.gov/FNCache/20140801174023000025/32539545_172.FOB
(http://vfc.idem.in.gov/FNCache/20140801174023000025/32539545_172.FOB)
Server response: 200(HTTP_OK)
OK

Please make sure this file can be accessed by typing it into your browsers address bar then pressing enter.

If the file exists then the browser will prompt you to download it.Cancel the prompt and report this problem to your Website Administrator.

If the file does not exist then the browser will provide you with an error message that may help further.

2.2 J&L CRUDE TANK FIELD

2.2.1 Recovery Sumps

System Type. Large diameter recovery sumps.

System Purpose and Objective. The purpose of this system is to recover FPH. The objective is to remove the FPH located inside the J&L crude tank field.

System Pumping Rate. 5-10 gpm per sump or skimming only.

System Duration. Sump pumped as needed with accumulation of FPH.

Brief System Description. A FPH plume was identified inside the J&L crude tank field. Two sumps were installed in March 1994 to begin FPH remediation of this area.

System Mechanics. Galvanized corrugated metal, 36 inch diameter, 12 feet long, 0.02 inch slotted, gravel filler packed sumps.

O&M. To be determined.

Plot Plan. None available.

Performance Evaluations. Quarterly fluid levels are monitored at this location.

System Dependencies. No system dependencies.

2.3 J&L AREA

2.3.1 J-141, Installed by the Refinery

System Type. Wellpoint system.

System Purpose and Objective. The purpose of this system is to establish hydraulic gradient control. The objective is to prevent the J&L highlands water from reaching the Lake George canal.

System Pumping Rate. 200-300 gpm.

System Duration. Continuous operation.

Brief System Description. Groundwater flows toward the south from the J&L highlands. This system provides hydraulic gradient control to prevent J&L highland water from entering the canal.

System Mechanics. The wellpoint system is 2,646 feet long, and 15 feet deep. The system is electrically heat traced. Section 2.4.2 discusses the J-141 extension to the catalyst pond remediation area.

O&M. The Refinery Environmental Inspectors are responsible for the O&M on the system.

Plot Plan. (See remediation system map.)

Performance Evaluations. Quarterly fluid levels taken to monitor groundwater gradient and FPH thickness and sentinel well monitoring program. The sentinel well monitoring program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. No system dependencies.

2.3.2 Catalyst Ponds Sheet Pile

System Type. Sheet pile and polymer seal.

System Purpose and Objective. The purpose of this system is to create a positive barrier cut off wall. The objective is to provide a positive barrier for floating FPH.

System Duration. The sheet pile life is expected to provide a positive cut off barrier for 30 years.

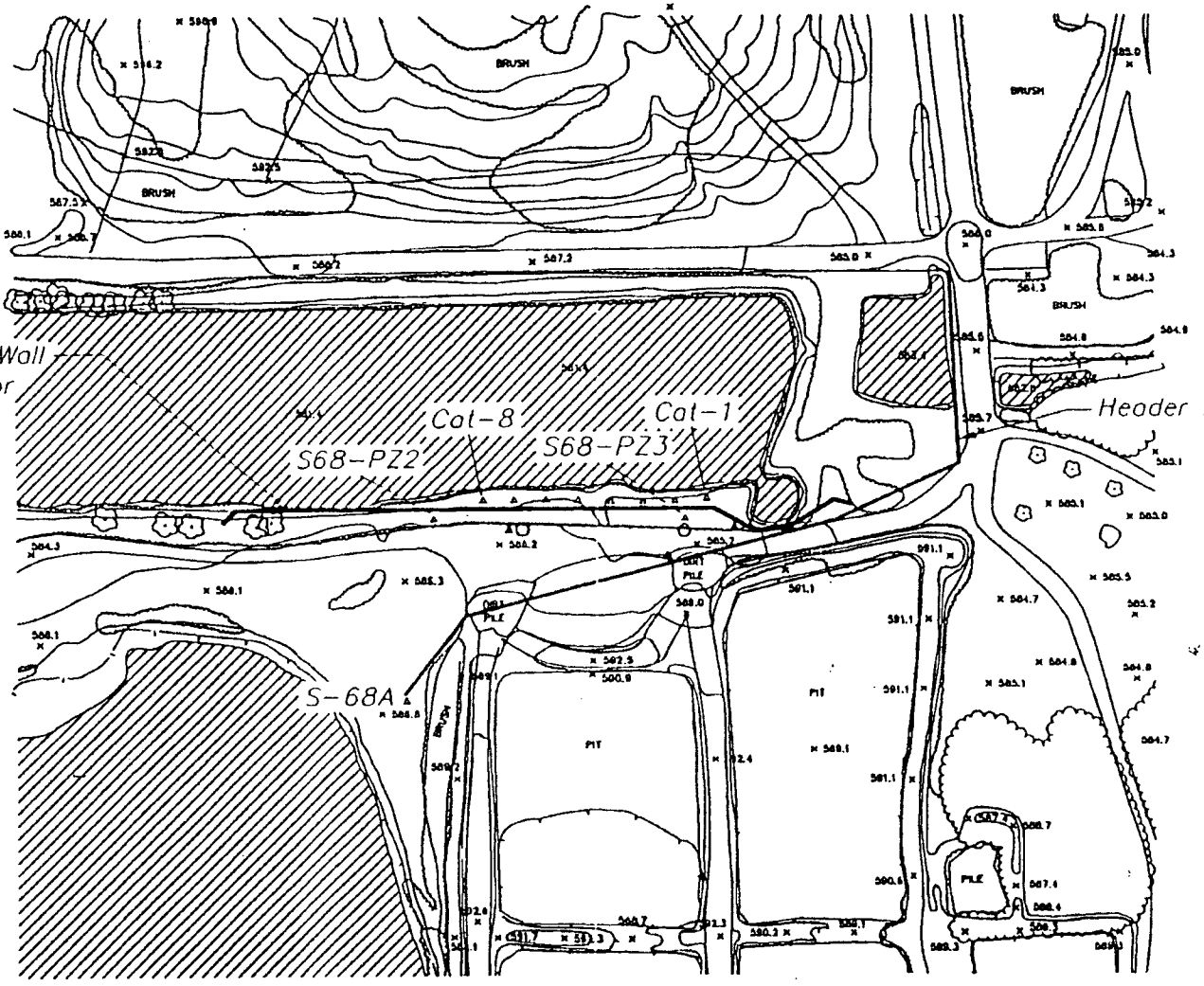
Brief System Description. A FPH plume was identified at this location. FPH was seen weeping into the Lake George canal. The sheet pile was installed along the south side of Lake George canal in 1993 with a polymer seal applied on the sheet pile joints to provide a positive barrier wall ten feet deep to prevent FPH from reaching the canal.

O&M. There is no O&M needed.

Plot Plan. (See remediation system map.)

Performance Evaluations. Quarterly fluid levels taken to monitor groundwater gradient and FPH thickness and sentinel well monitoring program. The sentinel well monitoring program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. This system is dependent upon the J-141 pump being operational. Two 36 inch diameter sumps have been installed along the outer edges of the sheet piling to prevent FPH from migrating around the positive sheet pile barrier wall.



LEGEND

▲ Well
O Sump

0 100 200
SCALE: 1"=200'

BASCOR Environmental, Inc.
consulting engineers and scientists

800 W. Central Road
Suite 104N
Mt. Prospect, Illinois 60056
(708) 577-1980

AMOCO WHITING REFINERY
CAT POND VERTICAL CUT-OFF WALL
LOCATION MAP

DATE	ISSUE			REV 0
DATE	ISSUE			
DATE 7-22-94	ISSUE AMOCO REVIEW			
DRAWN S.WHITNEY	CHECKED R.SENN	APPROVED S.SENN	DATE 7-22-94	
FILENAME: C:\DWGS\A093057\CPBORD.DWG		REFERENCE FILES: NONE		

2.3.3 Catalyst Pond J-141 Extension

System Type. Wellpoint system and vacuum recovery devices.

System Purpose and Objective. The purpose of this system is to establish hydraulic gradient control and recover FPH. The objective is to recover FPH at this location.

System Pumping Rate. Approximately 30-40 gpm.

System Duration. The wellpoint system will run three seasons. During the winter months the system will be turned off. The sheet pile will provide the area with a positive cut off wall.

Brief System Description. The wellpoint system extension was installed in September 1993 to prevent FPH from reaching the Lake George canal from the south.

System Mechanics. The wellpoint system is 600 feet long and 15 feet deep. The vacuum header is 8 inch diameter carbon steel.

O&M. The Refinery Environmental Inspectors are responsible for the wellpoint system.

Plot Plan. (See remediation system map.)

Performance Evaluations. Quarterly fluid levels taken to monitor groundwater gradient and FPH thickness and sentinel well monitoring program. The sentinel well monitoring program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. The system is dependent upon the J-141 system being operational.

2.3.4 South Lake George Canal Recovery Sumps

System Type. Two recovery sumps.

System Purpose and Objective. The purpose of this system is to remove FPH. The objective is to prevent oil from reaching the Lake George canal by installing FPH collection sumps to be used when FPH is present along the sheet pile barrier wall.

The sumps installed along the outer edges of the positive barrier sheet pile wall to prevent FPH from migrating around the barrier (and collect FPH).

System Pumping Rate. A belt skimmer powered by a windmill (no utilities present at site) is being tested in one sump. The second sump is vacuumed out as necessary.

System Duration. The sumps will be utilized as long as FPH accumulates.

Brief System Description. Two sumps were installed in October 1994 due to non-homogenous fill material beneath this area. The FPH appears to be in pockets versus in a continuous zone.

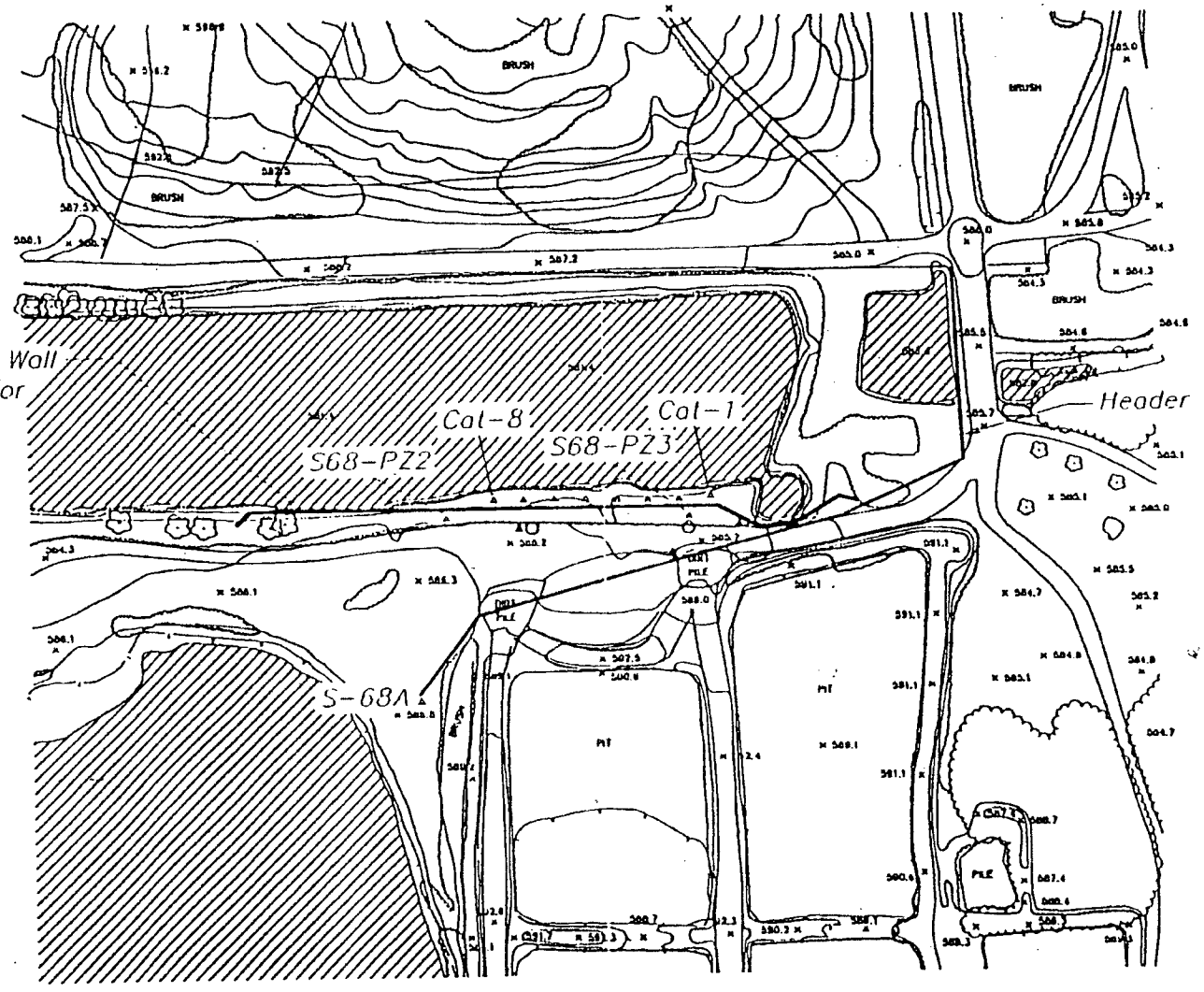
System Mechanics. The sumps consist of galvanized corrugated metal pipe, 36 inch in diameter and 12 feet long with 0.020 inch slotted screens.

O&M. Maintenance will be minimal. The Refinery Environmental Inspectors will be responsible for the O&M of this system.

Plot Plan. (See attached.)

Performance Evaluations. Quarterly fluid levels are monitored at this location.

System Dependencies. Initial performance indicates that minimal wind is necessary to operate the windmill system. If performance is acceptable, a second windmill may be installed at the second pump.



N

LEGEND

▲ Well
○ Sump

0 100 200

SCALE: 1"=200'

BASCOR Environmental, Inc.
consulting engineers and scientists

800 W. Central Road
Suite 104N
Mt. Prospect, Illinois 60056
(708) 577-1080

AMOCO WHITING REFINERY
CAT POND VERTICAL CUT-OFF WALL
LOCATION MAP

DATE	ISSUE			REV 0
DATE	ISSUE			
DATE 7-22-94	ISSUE AMOCO REVIEW			
DRAWN S.WHITNEY	CHECKED R.SENN	APPROVED S.SENN	DATE 7-22-94	
FILENAME: C:\DWGS\A093057\CPBORD.DWG		REFERENCE FILES: NONE		

2.3.5 J&L Outfall No. 3 Oil/Water Separation System

System Type. Sheet pile weir/HDPE lined channel/solids separator.

System Purpose and Objective. The purpose of this system is to provide a physical barrier in the channel which will provide separation of floating constituents from water flow in the Outfall No. 3 channel. The objective is to remove and recover floating materials.

System Flow Rate. The base flow in the channel varies, based on rainfall events. Flow varies from 0 to 15 gpm.

System Duration. The system was installed in September, 1993.

Brief System Description. A sheet pile is installed upstream of the existing separator, with an underflow/overflow weir to trap the floating constituents upstream of the weir. A skimmer pump recovers floating materials and stores them in a holding tank, returning water to the channel. The channel section 75 feet downstream of the sheet pile is lined with HDPE to prevent intrusion of groundwater into the surface water flow. A similar sheet pile is installed downstream of the existing separator where the sampling takes place. Flow is routed through a buried coated 24" CMP into the turning basin.

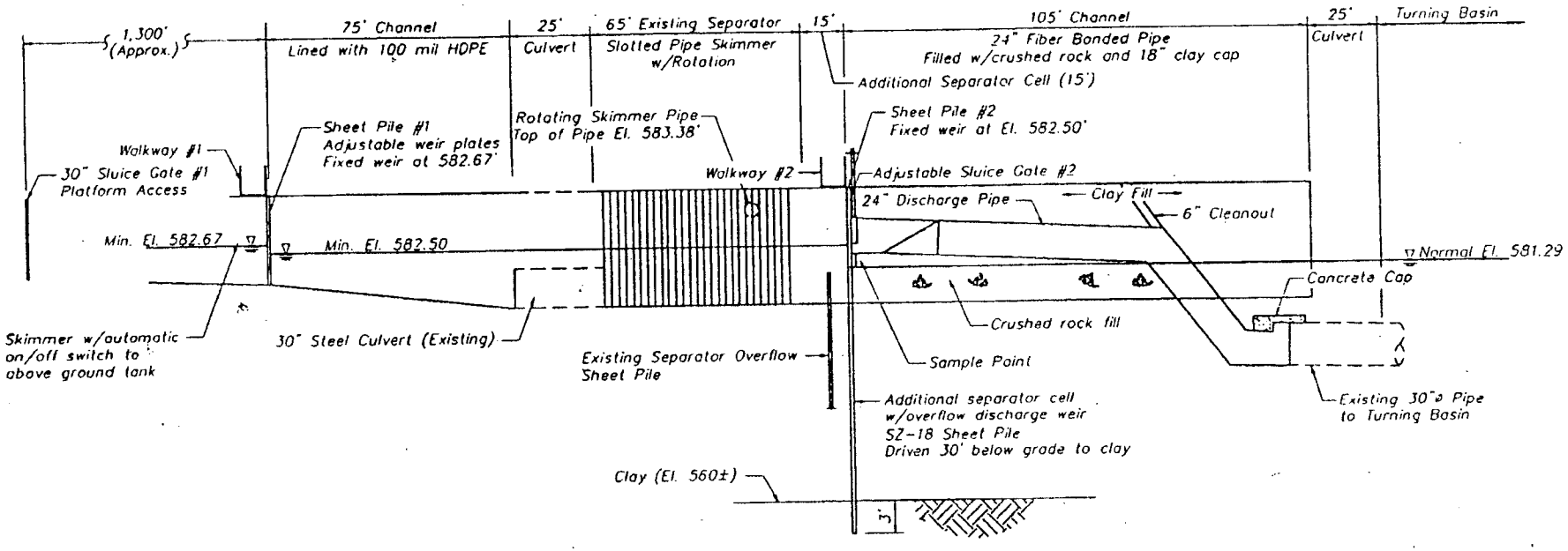
System Mechanics. A pump is located upstream of the sheet pile structure, and provides suction to a floating skimmer. The water is discharged into an oil/water separator box where the floating material is separated from the water.

O&M. An O&M manual is currently located inthe Amoco Environmental Inspectors area.

Plot Plan. Figure 2.

Performance Evaluations. NPDES sampling.

System Dependencies. This system requires routine maintenance to clear debris from the floating weir during fall and spring seasons.



MODIFICATION SECTION

BASCOR Environmental, Inc.
consulting engineers and scientists

AMOCO WHITING REFINERY
J&L AREA – OUTFALL #3
MODIFICATION SECTION

DRAWN	CHECKED	APPROVED	DATE
S.WHITNEY	R.SENN	S.SENN	9-22-94

FILENAME: C:\DWGS\A093031\ASBUILTS\MODSECT.DWG
REFERENCE FILES: NONE
F
RE 2

2.3.6 J&L Outfall No. 4 Pond

System Type. HDPE/Clay lined pond.

System Purpose and Objective. The purpose of this system is to provide a physical barrier between groundwater and surface water flow in the section of channel immediately downstream of the outfall sampling point. The objective is to separate surface and groundwater flows.

System Flow Rate. The base flow in the channel varies, based on rainfall events. Flow varies from 0 to 10 gpm.

System Duration. The system was installed in September, 1993 after discolored water was visually identified in the outfall channel.

Brief System Description. The storage pond is lined with HDPE and clay in order to prevent groundwater intrusion into surface water flows.

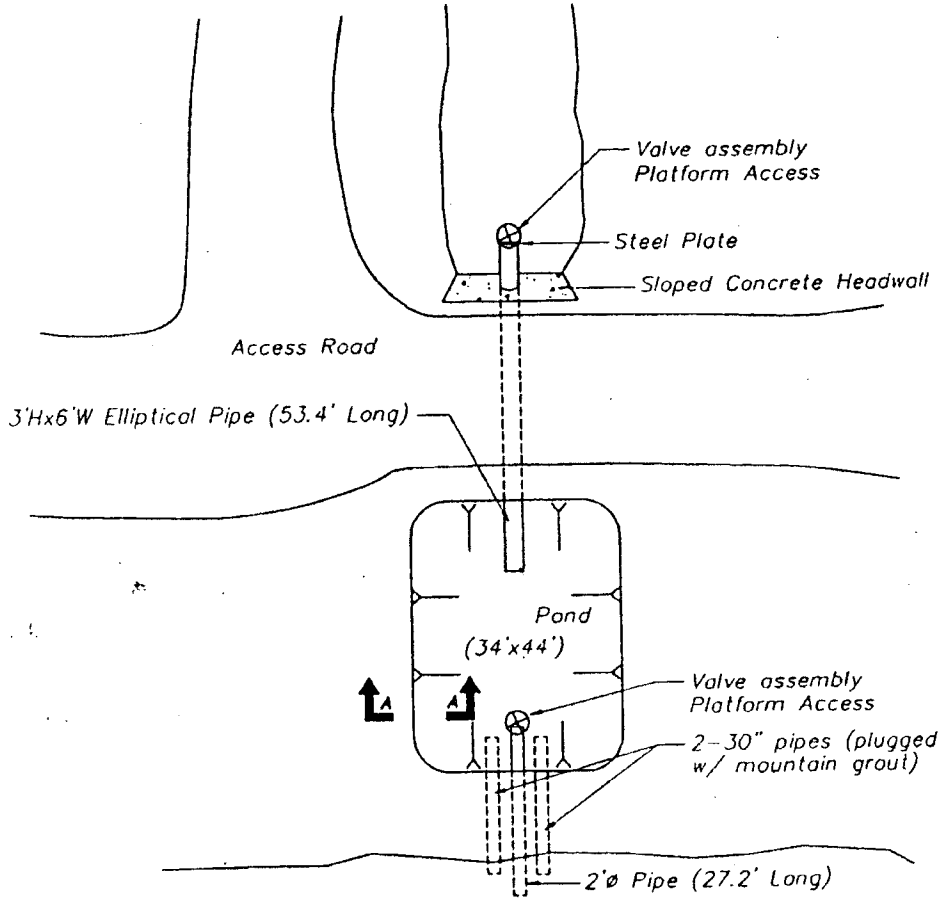
System Mechanics. N/A.

O&M. An O&M manual is not required.

Plot Plan. Figure 1.

Performance Evaluations. Visual inspection.

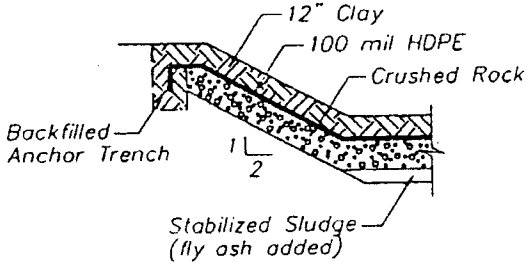
System Dependencies. None.



OUTFALL #4

0 15 30

SCALE: 1"=30'



SECTION A-A
OUTFALL #4

N.T.S.

BASCOR Environmental, Inc.
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AMOCO WHITING REFINERY
J&L AREA - OUTFALL #4
MODIFICATION DETAILS

DRAWN	CHECKED	APPROVED	DATE
S.WHITNEY	R.SENN	S.SENN	8-22-94

FILENAME: C:\DWGS\A093031\ASBUILTS\MOD4.DWG

REFERENCE FILES: NONE

FIGURE 1

2.4 CALUMET AVENUE WAREHOUSE AREA

2.4.1 Three Calumet Avenue Recovery Wells, Installed by the Refinery

System Type. Three large diameter recovery wells (J-47, J-48, and J-49).

System Purpose and Objective. The purpose of these recovery wells is to provide hydraulic gradient control south of the Calumet Avenue Warehouse. Three recovery wells were installed approximately 200 feet apart. The objective is to remove FPH from the property boundary of the Calumet Avenue Warehouse.

System Pumping Rate. The wells are pumping on timers at an average rate of 5 gpm each.

System Duration. The system operates continuously on timers.

Brief System Description. The system was installed in 1986 and was designed to pump FPH from each recovery well.

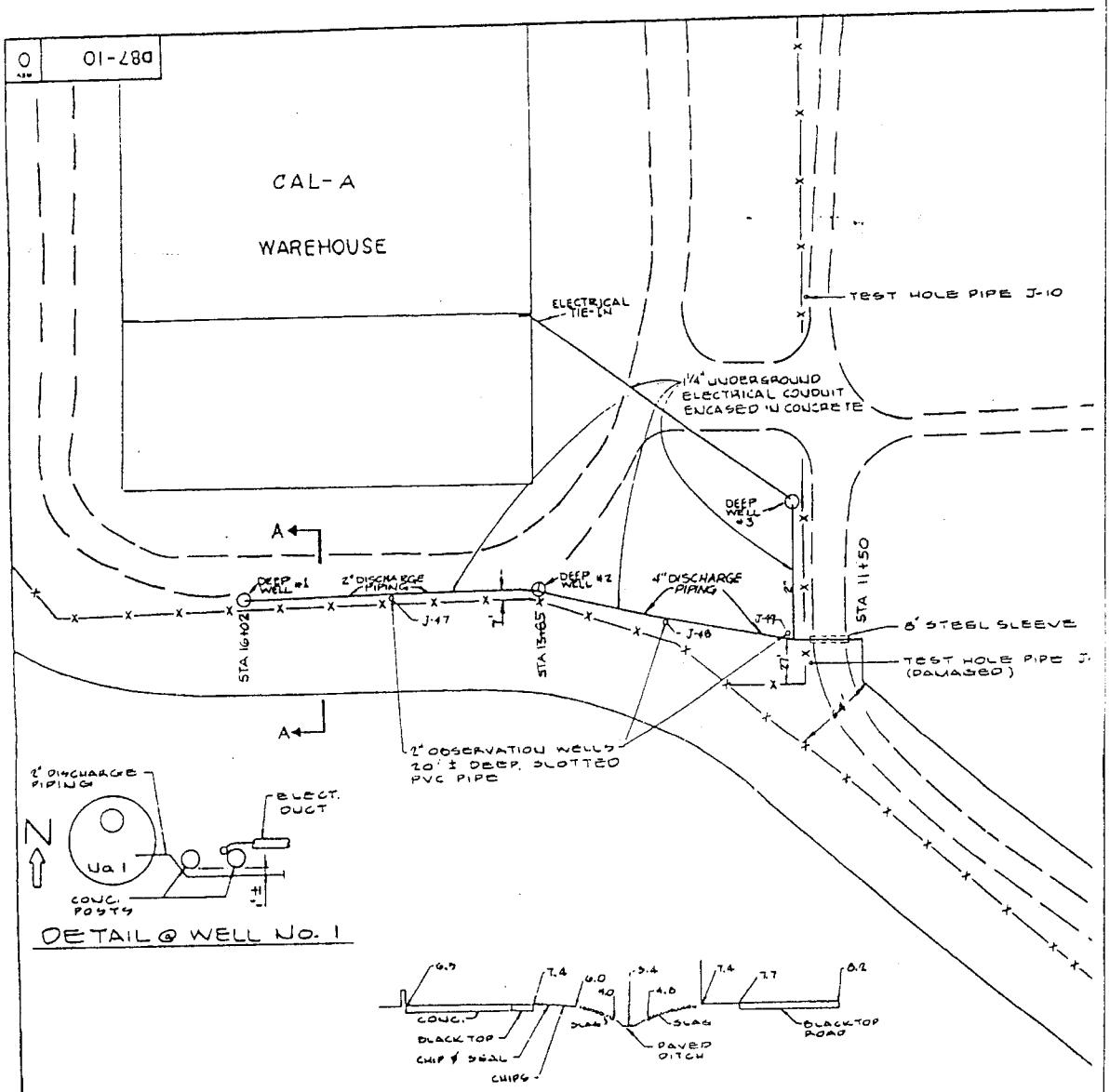
System Mechanics. Three 10 inch diameter PVC recovery wells. Electric submersible (Grundfos 40S30-9).

O&M. The Refinery Environmental Inspectors are responsible for O&M of these systems.

Plot Plan. (See remediation system map.)

Performance Evaluations. Quarterly fluid levels are taken at this location.

System Dependencies. This system is dependent upon operations of the 12 inch dewatering line used to discharge the total fluids recovered from recovery wells J=47, J-48, and J-49.



DETAIL @ WELL NO. 1

SECTION A-A

1" = 20'-0" HOR. SCALE

CROSS SECTION LOOKING WEST

NO	DATE	BY	REVISION	DWG. NO.	REFERENCE DRAWINGS	ISSUED FOR	BY	DATE	EST	APPR	NO

2.4.2 APL Xylene Recovery Well

System Type. One large diameter recovery well.

System Purpose and Objective. The purpose of this recovery well is to establish hydraulic gradient control and recover FPH. The objective is to recover any FPH xylene beneath the area where it leaked and to provide hydraulic containment of the impacted area.

System Pumping Rate. The system was designed to pump between 10-15 gpm.

System Duration. Continuous operation as long as necessary to recover product.

Brief System Description. The system was installed on April 8, 1993, as an interim groundwater recovery system.

System Mechanics. Well design and installation:

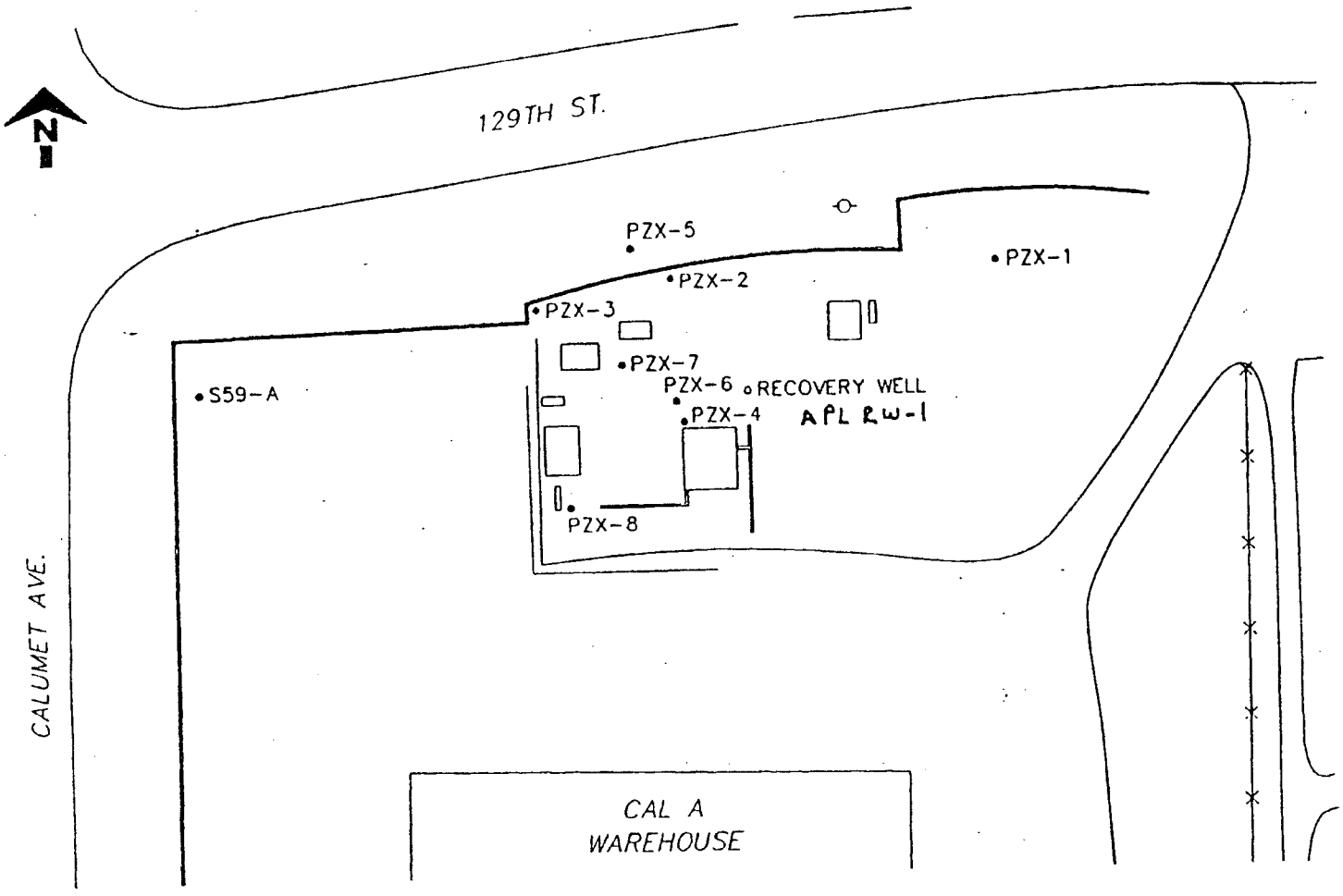
- drilled to a minimal diameter of 24 inches;
- drilled to a final depth of 22 feet;
- a screened interval of 4 feet to 18 feet;
- a base sump of 3 feet; and
- a 12 inch I.D. well screen and riser comprising 304 stainless steel, wirewrap, and utilizing a number 12 slot size (0.012 inch) opening.

O&M. APL is responsible for all O&M associated with this FPH recovery system.

Plot Plan. (See attached.)

Performance Evaluations. Quarterly fluid levels taken to monitor groundwater gradient and FPH thickness and sentinel well monitoring program. The sentinel well monitoring program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. This system is not dependent upon any other systems.



0 50 100

SCALE: 1"=100'

AMOCO

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consulting engineers and scientists

WELL LOCATION MAP

AMOCO PIPELINE XYLENE AREA

DRAWN	CHECKED	APPROVED	DATE
S.WHITNEY	R.SENN	S.SENN	5-10-94

FILENAME: C:\DWGS\A094067\WELLMAP.DWG

REFERENCE FILES: NONE

FIGURE 2

2.4.3 Calumet Avenue Cloverleaf Sheet Pile

System Type. Sheet pile and polymer seal.

System Purpose and Objective. The purpose of sheet pile is to establish a positive barrier cut off wall. The objective is to provide a positive barrier for floating FPH.

System Duration. The sheet pile life is expected to be 30 years to provide a positive cut off barrier.

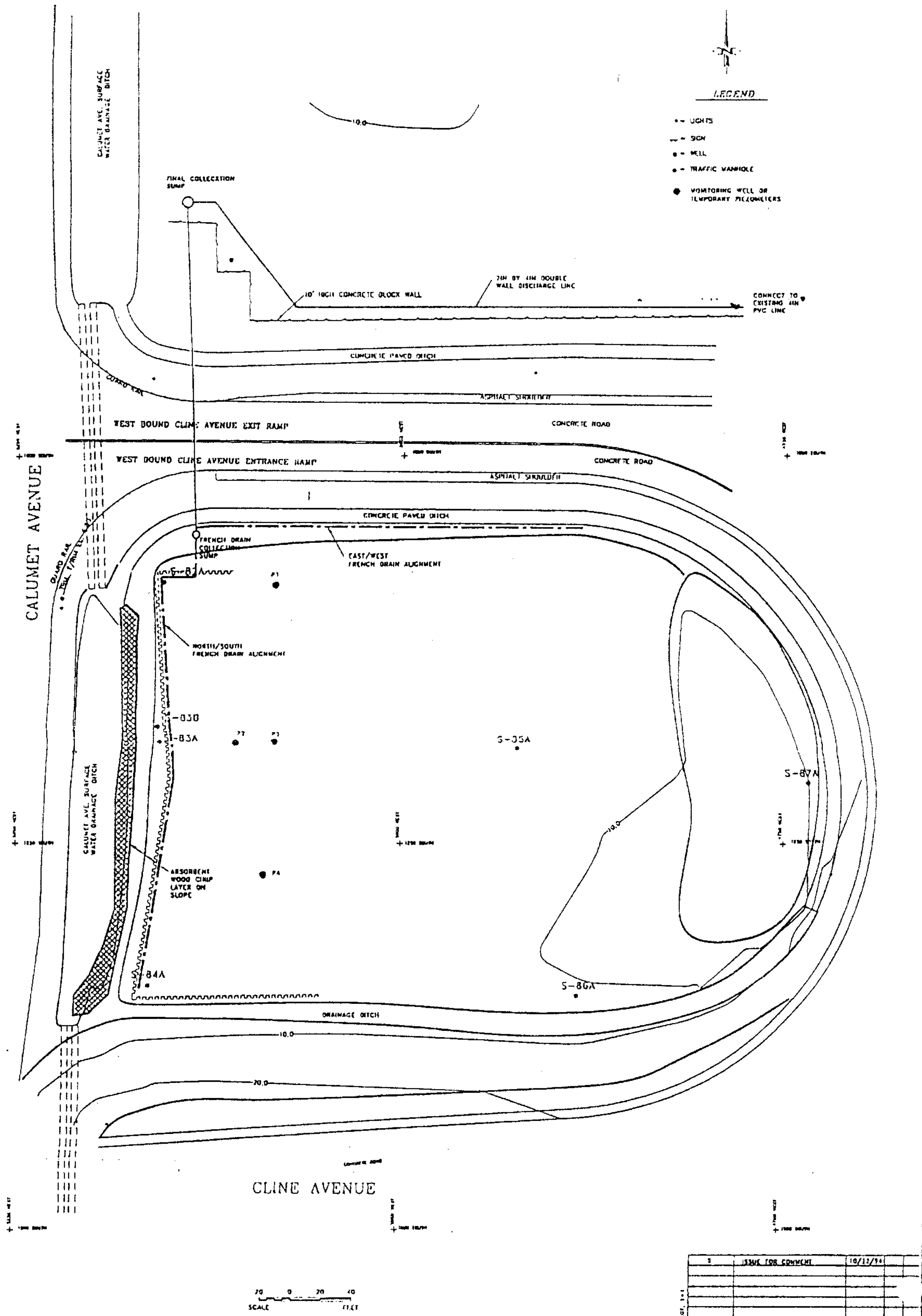
Brief System Description. A FPH plume was identified at this location. FPH was visually seen seeping into the Calumet Avenue stormwater drainage ditch. The sheet pile was installed in January 1995 along with the polymer seal at the sheet pile joints to provide a positive barrier wall 15 feet deep to prevent FPH from flowing into the Calumet Avenue drainage ditch.

O&M. There is no O&M needed.

Plot Plan. (See attached.)

Performance Evaluations. Not applicable. This is a passive barrier system.

System Dependencies. The positive barrier wall will be dependent on a shallow french drain system to provide FPH recovery at this location.



3	ISSUE FOR COMMENT	10/12/94		
Revision No.	Description	Date	By	App.

REVISIONS

AMOCO OIL COMPANY
WHITING REFINERY

CALUMET AVENUE CLOVERLEAF
PRODUCT REVOVERY SYSTEM

SITE PLAN

Designed by: CY	Drawn by: JH	Checked by:	Approved by:
Date: NOV. 1994	Project No.	Drawing No.	

Woodward-Clyde Consultants
CONSULTING ENGINEERS, GEOLOGISTS, AND ENVIRONMENTAL SCIENTISTS

2.4.4 Future Calumet Avenue French Drain

System Type. Shallow interceptor trench.

System Purpose and Objective. The system installation is scheduled for the spring of 1995. The objective of the shallow interceptor trench is to prevent FPH from entering the ditch along the Cline Avenue entrance ramp.

System Pumping Rate. The system is designed to pump between 40 to 75 gpm.

System Duration. As long as necessary to contain FPH.

Brief System Description. Due to the non-homogeneous fill located at the Cline Avenue cloverleaf, the system will be designed to intercept the road bedding material beneath the concrete entrance ramp which contains FPH.

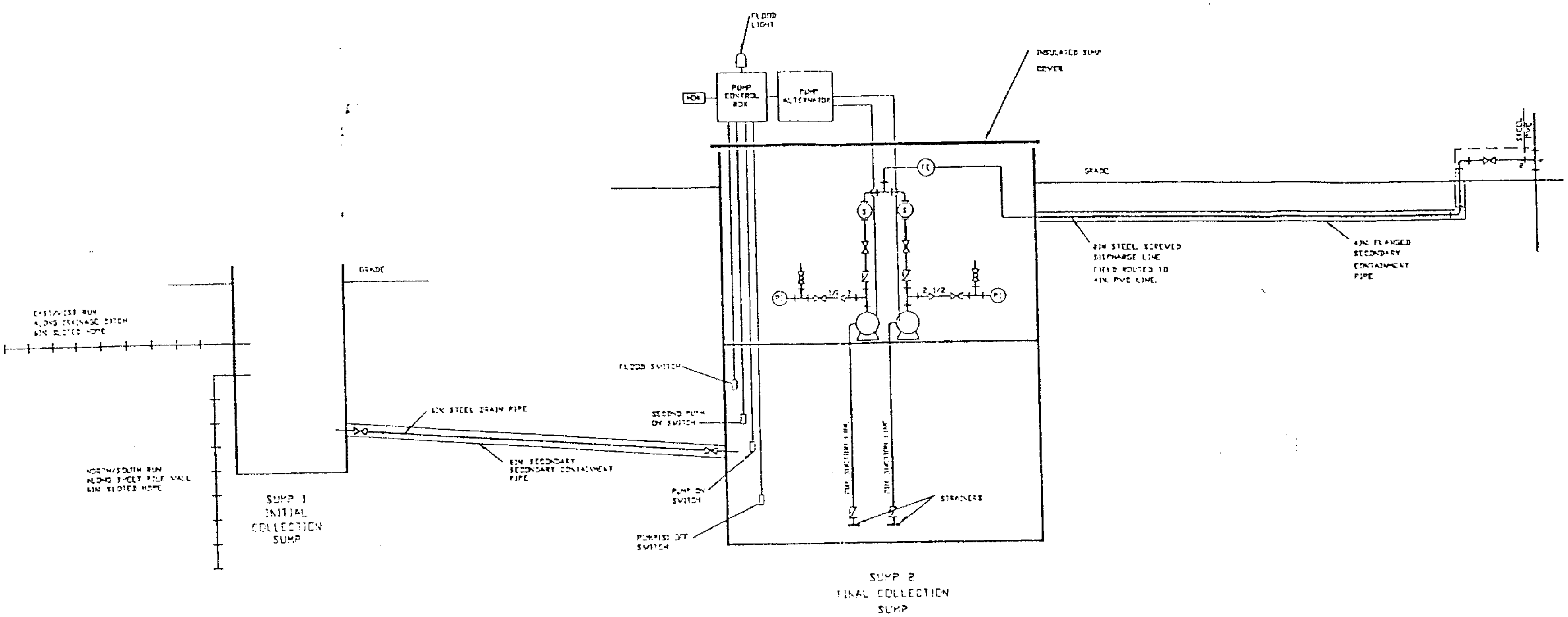
System Mechanics. Dual discharge electric submersible pumps for non-rain event and rain event has a maximum tandem pumping rate of 90 gpm.

O&M. Currently no O&M manual available (future system).

Plot Plan. (See attached.)

Performance Evaluations. Future performance evaluation of system.

System Dependencies. This system is dependent upon the existing 12 inch dewater line available capacity. The current study performed by Orbital Engineering indicates moderate discharge capacity.



LEGEND*

- WATER DISCHARGE LINE;
- ELECTRICAL HEAT TRACE AND INSULATE
- PI — PRESSURE INDICATOR
- S — BASKET STRAINER
- FE — FLOW ELEMENT (1–50gpm)
- CHECK VALVE
- BALL VALVE
- GLOBE VALVE
- GATE VALVE
- REDUCER (OR BUSHING)
- BARBED HOSE CONNECTOR

* SYMBOLS AS PER AMOCO STANDARD 54D-14

REVISIONS

AMOCO OIL COMPANY
WHITING REFINERY

CALUMET AVENUE CLOVERLEAF
PRODUCT REVOVERY SYSTEM

PIPING AND INSTRUMENTATION
DIAGRAM

Woodward-Clyde Consultants

Cont 11/01

3.1 LOWER SCHRAGE FIRST STREET

3.1.1 J-139 Wellpoint

System Type. Wellpoint.

System Purpose and Objective. The purpose of this system is to establish hydraulic gradient control and recover FPH. The objective is to prevent FPH from leaving the Indiana Tank Field's western perimeter.

System Pumping Rate. 200 gpm.

System Duration. Continuous operation as needed to maintain control in conjunction with J-138.

Brief System Description. This interim system was installed in 1981 and was designed to prevent the migration of hydrocarbons from Amoco's perimeter boundaries. Vacuum recovery devices were installed in 1993 to recover FPH.

System Mechanics. The wellpoint system has two 50 hp vacuum, assisted centrifugal water cooled pumps. This system contains 2,876 feet of wellpoint vacuum header pipe with 235 wellpoints operational and 72 vacuum recovery devices running in tandem with this system.

O&M. The Refinery Environmental Inspectors are responsible for O&M of this system.

Plot Plan. (See remediation systems map.)

Performance Evaluations. Quarterly fluid levels taken to monitor groundwater gradient and FPH thickness and sentinel well monitoring program. The sentinel well monitoring program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. This system is dependent on the J-138 and J-140 wellpoint system being operational.

3.1.2 Pilot Biovent System

System Type. Pilot horizontal well biovent system.

System Purpose and Objective. The purpose of this system is to remediate stained soils. The objective is to remediate stained soils above the depressed water table in the area of First Street between 125th and 129th Streets. Soil containing diesel to naphtha range hydrocarbons will be remediated by the utilization of insitu bioremediation (bioventing). The system is designed to provide oxygen to the naturally occurring microbes via a vacuum bioventing technology.

System Pumping Rate. The system was designed to pump from 200 cfm to 250 cfm from a 350 linear foot, 4 inch horizontally installed well screen.

System Duration. The pilot system ran for five days at different flow rates.

Brief System Description. The pilot biovent system was installed 8.5 feet deep beneath First Street from 127th Street to the City of Whiting vacant lot.

System Mechanics. One Roots type blower, two 80 gallon capacity water knock out drums, two sediment traps, one 350 L.F. horizontally installed well screen.

O&M. An O&M manual has not been provided for this system. This phase of the project was a pilot test.

Plot Plan. (See attached.)

Performance Evaluations. The pilot study indicated that a flow rate of 200 cfm will provide the necessary radius of influence to remediate the stained soils along First Street.

System Dependencies. This system is dependent on the operation of the J-139 wellpoint system depressing the water table beneath the final installation depth of the horizontal biovent wells.

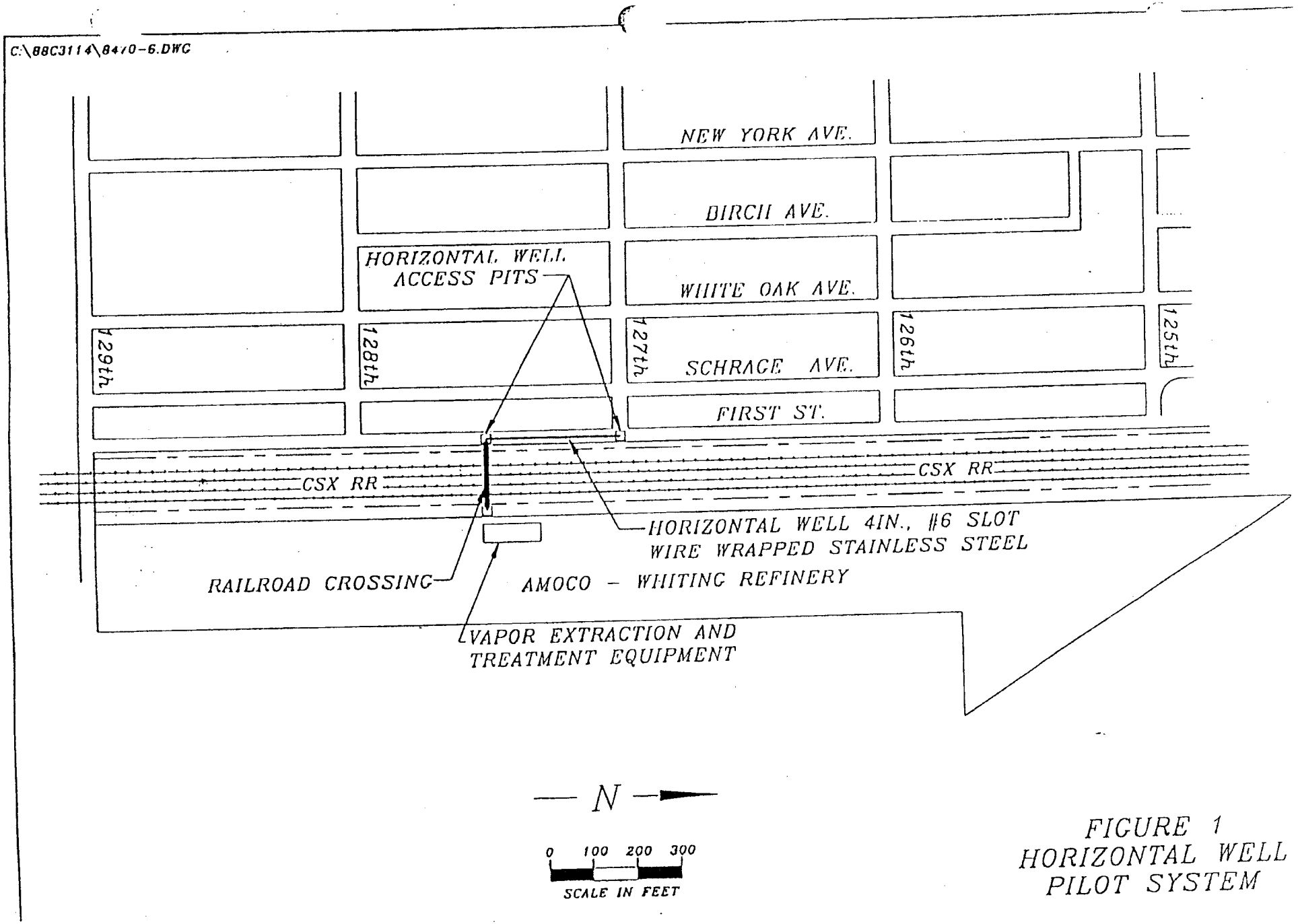
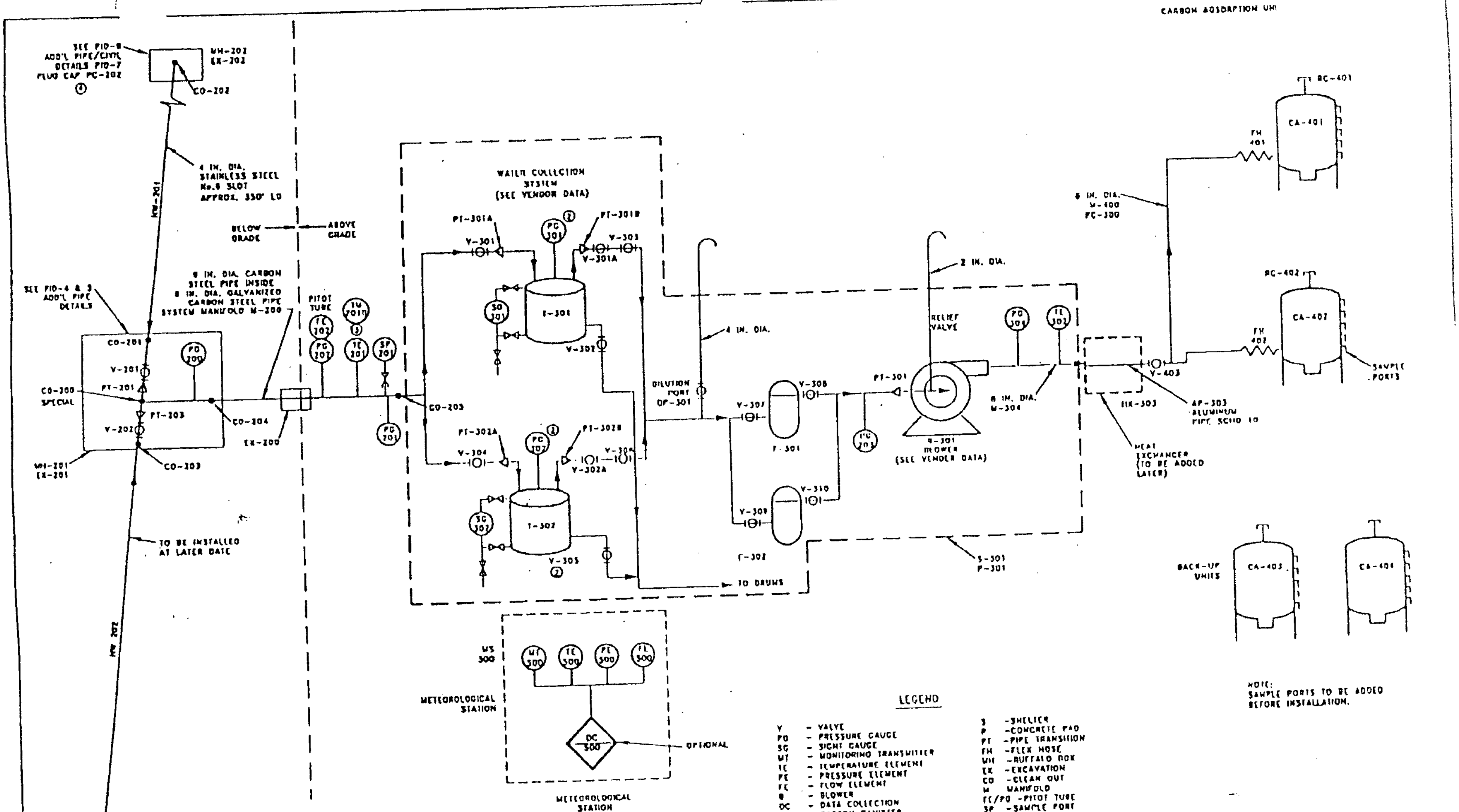


FIGURE 1
HORIZONTAL WELL
PILOT SYSTEM



NOTE:
SAMPLE PORTS TO BE ADDED BEFORE INSTALLATION.

LEGEND

V	- VALVE
PG	- PRESSURE GAUGE
SG	- SIGHT GAUGE
MT	- MONITORING TRANSMITTER
TE	- TEMPERATURE ELEMENT
PE	- PRESSURE ELEMENT
FE	- FLOW ELEMENT
B	- BLOWER
DC	- DATA COLLECTION
CA	- CARBON CANISTER
F	- FILTER
HW	- HORIZONTAL WELL
SP	- SAMPLING PORT
HX	- HEAT EXCHANGER
MS	- METEROLOGICAL STATION
DP	- DILUTION PORT
S	-SHELTER
P	-CONCRETE PAD
PT	-PIPE TRANSITION
FH	-FLEX HOSE
MH	-BUFFALO BOX
EX	-EXCAVATION
CO	-CLEAN OUT
M	MANIFOLD
FE/PG	-PITOT TUBE
SP	-SAMPLE PORT
PC	-PLUG CAP
AP	-ALUMINUM PIPE
①	-SEE NOTE

NOTE:
1. ALL PIPING IS CARBON STEEL 8 IN. DIA. SCH. 40 UNLESS OTHERWISE NOTED.
2. V-302,305, PG 301,302 DELIVERED WITH T-301, T-302
3. 8 1/2 PIPE DIA. REQ'D BEFORE PITOT TUBE AND 2 1/2 PIPE DIA. AFTER.
4. MISC. INSTRUMENTATION BY WCC

REV: 4 TH 2/11/94

Woodward-Clyde Consultants

OFFSITE REMEDIATION PHASE III
PIPING AND INSTRUMENTATION DIAGRAM

R0C3114\D471

3.1.3 Future Full Scale Biovent System

System Type. Horizontal well biovent system.

System Purpose and Objective. The purpose of this system is to remediate stained soils on First Street.

System Pumping Rate. 200-800 cfm.

System Duration. System performance will be evaluated after 6 months operation of full scale biovent system.

Brief System Description. (See preliminary P&ID.)

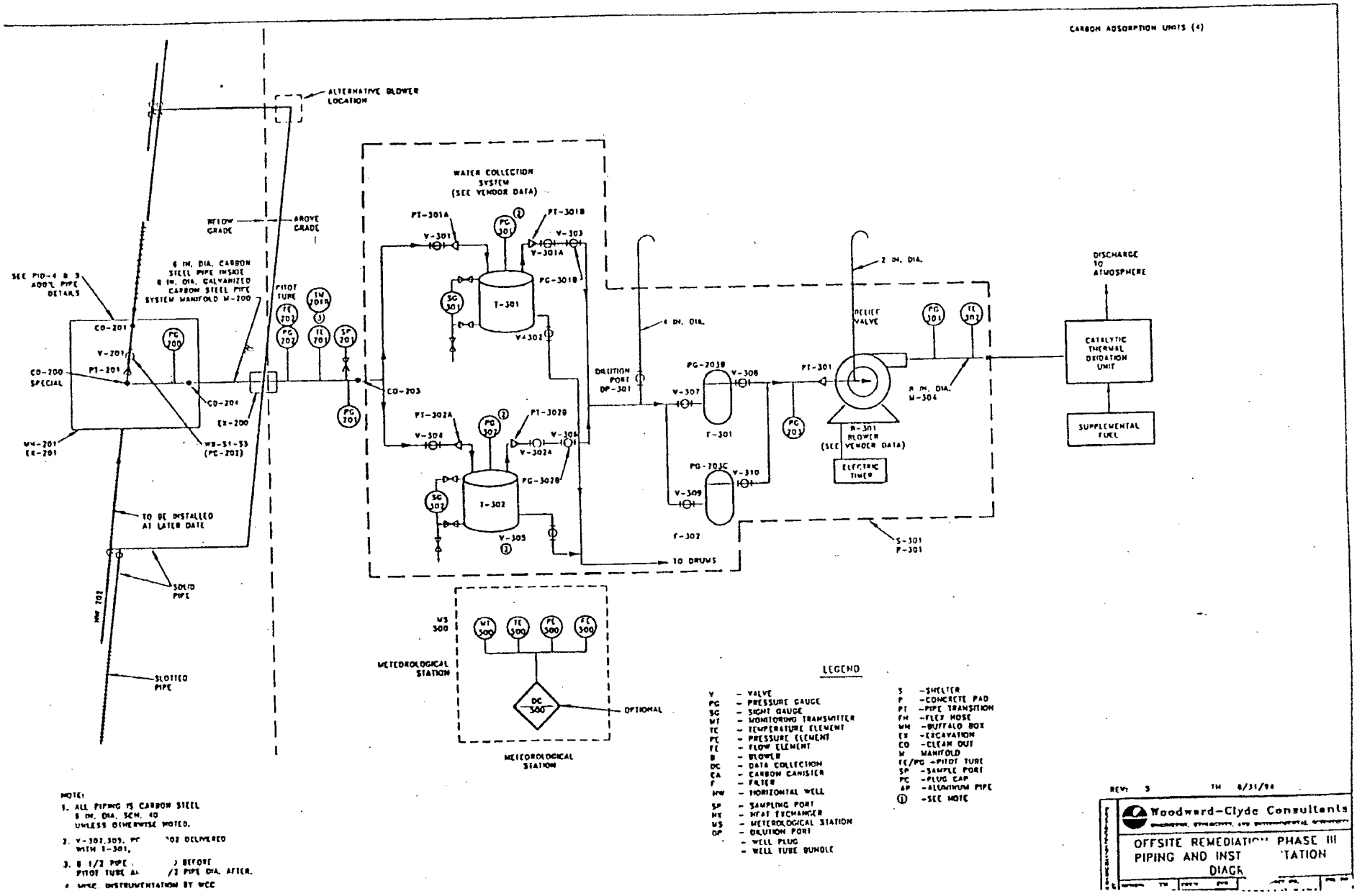
System Mechanics. To be determined.

O&M. Currently none available.

Plot Plan.

Performance Evaluations. Yearly insitu respiration test for oxygen and carbon dioxide.

System Dependencies. This system is dependent on the operation of the J-139 wellpoint system depressing the water table beneath the final installation depth of the horizontal biovent wells.


CARBON ADSORPTION UNITS (4)
ALTERNATIVE BLOWER LOCATION
WATER COLLECTION SYSTEM (SEE VENDOR DATA)
BELOW GRADE
ABOVE GRADE
6 IN. DIA. CARBON STEEL PIPE INSIDE 8 IN. DIA. GALVANIZED CARBON STEEL PIPE SYSTEM MANIFOLD M-200
SEE PID-4 & 5 ADD'L PIPE DETAILS
CO-201
PG 200
V-201
PT-201
CO-200 SPECIAL
CO-204
EX-200
MW-201 EX-201
WS-51-53 (PC-202)
TO BE INSTALLED AT LATER DATE
SOLID PIPE
MW 701
SLOTTED PIPE
PITOT TUBE
TE 702
PC 702
TE 701
SP 701
PC 701
CO-203
PT-301A
PC 301
PT-301B
V-301
V-303
V-301A
PG-301B
SG 301
T-301
V-302
PT-302A
PG 302
PT-302B
V-304
V-306
V-302A
PG-302B
T-302
V-305
DILUTION PORT DP-301
4 IN. DIA.
PG-303B
V-308
V-307
T-301
PT-301
PC 701
2 IN. DIA.
RELIEF VALVE
PG 301
TE 301
R-301 BLOWER (SEE VENDOR DATA)
ELECTRIC TIMER
8 IN. DIA. M-304
PG-303C
V-310
V-309
T-302
S-301 P-301
TO DRUMS
DISCHARGE TO ATMOSPHERE
CATALYTIC THERMAL OXIDATION UNIT
SUPPLEMENTAL FUEL
WS 300
WT 300
TE 300
PE 300
FE 300
METEOROLOGICAL STATION
DC 500
OPTIONAL
METEOROLOGICAL STATION
LEGEND
V - VALVE
PG - PRESSURE GAUGE
SG - SIGHT GAUGE
MT - MONITORING TRANSMITTER
TE - TEMPERATURE ELEMENT
PE - PRESSURE ELEMENT
FE - FLOW ELEMENT
B - BLOWER
DC - DATA COLLECTION
CA - CARBON CANISTER
F - FILTER
HW - HORIZONTAL WELL
SP - SAMPLING PORT
HX - HEAT EXCHANGER
WS - METEOROLOGICAL STATION
DP - DILUTION PORT
- WELL PLUG
- WELL TUBE BUNDLE
S - SHELTER
P - CONCRETE PAD
PT - PIPE TRANSITION
FH - FLEX HOSE
MH - BUFFALO BOX
EX - EXCAVATION
CO - CLEAN OUT
M - MANIFOLD
PE/PG - PITOT TUBE
SP - SAMPLE PORT
PC - PLUG CAP
AP - ALUMINUM PIPE
① - SEE NOTE
NOTE:
1. ALL PIPING IS CARBON STEEL 8 IN. DIA. SCH. 40 UNLESS OTHERWISE NOTED.
2. V-302,305, PT 302 DELIVERED WITH T-301.
3. 8 1/2 PIPE) BEFORE PITOT TUBE A /2 PIPE DIA. AFTER.
4 SHOP INSTRUMENTATION BY WCC
REV: 5 TM 8/31/94
Woodward-Clyde Consultants
OFFSITE REMEDIATION PHASE III
PIPING AND INST TATION
DIAGR

3.2 INDIANAPOLIS BOULEVARD

3.2.1 Wellpoint System

System Type. Wellpoint system.

System Purpose and Objective. The purpose of this system is to establish hydraulic gradient control. The objective is to prevent FPH from entering the sewer under Indianapolis Boulevard.

System Pumping Rate. 60 to 80 gpm.

System Duration. Until newly installed recovery wells are operating and the Indiana State sewer upgrade is completed along Indianapolis Boulevard.

Brief System Description. The Indianapolis Boulevard system was installed to prevent FPH from entering the sewer under Indianapolis Boulevard by lowering the water table in that area.

System Mechanics. The system has a 30 HP vacuum pump/centrifugal oil cooled pump. The system has approximately 750 linear feet of vacuum header pipe with 31 active wellpoints. The wellpoints were installed with #5 sand around the screen.

O&M. To be prepared by Bascor Environmental, Inc.

Plot Plan. (See remediation system map.)

Performance Evaluations. Quarterly fluid levels taken to monitor groundwater gradient and FPH thickness and sentinel well monitoring program. The sentinel well monitoring program was established to monitor the FPH plumes along Amoco's perimeters and offsite locations. These wells will be monitored on a more frequent basis than the quarterly fluid level well locations.

System Dependencies. This system is being evaluated for interaction with J-138 and other refinery systems by modeling the effects.

TABLE 1

AMOCO WHITING REFINERY WELLPOINT SYSTEMS(1)

Wellpoint System	System Installation Date	Average Pumping Rate (gpm)	Hydraulic Control	FPH Recovery VRD Added	Flow Meters Totalizer	Number of Wellpoints	Wellpoint Spacing (ft.)	System Length	Wellpoint Depth (Feet)	VRD Depth	VRD Total	Wellpoint Heat Trace
J-136	1993	200	Yes	Yes	Yes	200	10	2,000	15	10	187	No
J-137	1992	150-250	Yes	Yes	Yes	99	8	1,080	19.5-21	20	24	Yes
J-138A North	1991	200 for entire	Yes	Yes	Single	Combined A&B	10	Combined A&B	21	20	189 for entire	Yes
J-138B South	1991	J-138A, B,	Yes	Yes	Single	and	10	and	21	20	J-138A, B,	Yes
J-138 Extension	1994	Extension	Yes	Yes		Ext. 254	10	Ext. 2714	21	20	Extension	Yes
J-139	1981 (2)	200	Yes	Yes	Yes	235	10	2,876	15	15	72	No
J-140	1981	70	Yes	Yes	Yes	73	10	1,370	15	20	44	Yes
J-141	1988	200-300	Yes	No	Single	174	10	2,646	15	None	0	Yes
J-141 Extension	1993	50	Yes	Yes	No	13	10	600	15	15	11	Yes
J-156	1968-70	100	Yes	No	Yes	114	10	1,660	15	None	0	No
J-157	1968-70	55	Yes	No	Yes	234	10	2,790	15	None	0	No
J-158	1968-70	100	Yes	No	Yes	74	10	980	15	None	0	No
J-159	1968-70	200	Yes	No	Yes	131	10	1,598	15	None	0	No
J-160	1968-70	50	Yes	Yes	Yes	139	10	1,455	15	18	22	No
J-160 Extension	1994	50	Yes	Yes	No	50	10	600	15	8	10	No
J-161	1992	150	Yes	No	Yes	125	10	650	18	None	0	No
Ind. Blvd. Gate 20	1994	60	Yes	No	Yes	31	10	650	18	None	0	No

(1) This list includes only existing, operational wellpoint systems. It does not include french drains, wellpoint systems, pumps and other containment and recovery systems that Amoco has used in the past to address ground oil concerns.

(2) Replaced earlier french drain and wellpoint systems along the western border of Indiana Tank Field dating back to the early 1970s. J-139 was extended south to 129th Street in 1983.

(3) Replaced earlier french drain and other systems dating back to the early 1970s.

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